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# PROVISIONAL THERMODYNAMIC FUNCTIONS OF PROPANE, FROM 85 TO 700 K AT PRESSURES TO 700 BAR

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Robert D. Goodwin

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Cryogenics Division  
Institute for Basic Standards  
National Bureau of Standards  
Boulder, Colorado 80302

July 1977

Prepared for:  
The American Gas Association  
1515 Wilson Boulevard  
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## PREFACE

The Cryogenics Division of the National Bureau of Standards, with support from the American Gas Association, is providing experimental data and computational methods for the thermophysical properties of both the pure components and the mixtures which constitute liquefied natural gas (LNG).

The present report on propane is the third in a series on the pure components. The properties of methane were published in NBS Technical Note 653 (April 1974), and those of ethane in NBS Technical Note 684 (August 1976) [29].

Our objective in the present report is to discover the availability and deficiencies of physical properties data needed for computation of the thermodynamic properties of propane, and at the same time to produce useful interim results.

In the range of normal boiling temperatures for LNG, the vapor pressures, vapor densities, and heats of vaporization of propane cannot be measured accurately by any existing experimental techniques. Computational methods for the thermodynamic network have been devised to circumvent these difficulties in so far as possible.

The present results, covering the entire range of fluid states of propane, have become possible by use of recent  $P$ - $\rho$ - $T$  data for the compressed liquid [22], ideal gas specific heats from spectroscopic data [9], and specific heats  $C_p(T)$  over a wide range of conditions [67].

All of the analytical formulations of physical properties data in this report have been developed for the data on propane, and are new as compared with our earlier work on ethane.

PROVISIONAL THERMODYNAMIC FUNCTIONS OF PROPANE FROM 85 TO 700 K

AT PRESSURES TO 700 BAR<sup>\*</sup>

Robert D. Goodwin

Thermophysical properties of propane are tabulated at integral temperatures over the entire range of fluid states from 85 to 700 K along isobars to 700 bar. A modified form of the nonanalytic equation of state is employed for the first time. Thermodynamic functions for the compressed liquid are obtained by use of heats of vaporization from the boiling point to the critical point, such that the free energies of saturated liquid and vapor are equal.

Key words: Densities; enthalpies; entropies; equation of state; internal energies; isobars; isochores; isotherms; Joule-Thomson inversion; latent heats of vaporization; melting line; orthobaric densities; propane; specific heats; speeds of sound; vapor pressures.

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\* This work at the National Bureau of Standards was supported by the American Gas Association, 1515 Wilson Boulevard, Arlington, Virginia 22209.



## 1. INTRODUCTION

The economic importance of propane, as one of the constituents of LNG, is well known. Our objective is to produce basic thermodynamic information on the pure components of LNG, needed both for the pure substances per se, and for the prediction of properties of mixtures.

The present work on propane provides background on available physical properties data. The tables of derived thermodynamic functions may serve engineering needs until such time as new physical data permit a revision of these tables.

Our computational method differs from that used in previous reports for compressed liquid states at  $T < T_c$ . We have estimated the heats of vaporization from the boiling- to the critical-temperature. Use of these "data" to cross the "dome" of figure 1 along isotherms yields a free energy change of zero for the vapor-liquid equilibrium transition.

Symbols and units for this report are listed in Appendix A.

## 2. PHYSICAL PROPERTIES AND THEIR FORMULATION

### 2.1 Fixed-Point Values

These values are listed in Appendix B.

(a) The Triple Point. The temperature is adopted from Das and Eubank [15]. The pressure was selected by trial for the present vapor-pressure equation (2). The liquid density is assigned for consistency with data in equation (3). The vapor density is from the ideal gas law.

(b) The Boiling Point. The temperature is from vapor-pressure equation (2) at a pressure of 1 atm = 1.01325 bar. Liquid and vapor densities are from equations (3) and (4). The heat of vaporization from equation (10) is 0.45%

greater than the experimental ( $\pm 0.1\%$ ) value of Kemp and Egan [38], whereas that from the Clapeyron equation is 0.25% greater.

(c) The Critical Point. The temperature was selected to give a best "fit" of orthobaric densities data, equations (3) and (4). The pressure is given by vapor-pressure equation (2). The density was selected by trial to yield a well-behaved critical isotherm from the equation of state. It is about 1% lower than values reviewed in reference [15].

## 2.2 Melting Line and Vapor Pressures

(a) The Melting Line. Experimental pressures from about two to ten kilobars were reported by Reeves, Scott, and Babb [52] as constants for the Simon equation (1). Their extrapolation to zero pressure gave  $T_t = 85.3$  K. As their uncertainty in  $T$  was at least 1 K, we have used our selected triple-point temperature,

$$P = P_t + P_o \cdot [(T/T_t)^\epsilon - 1], \quad (1)$$

with  $P_t$  from Appendix B,  $T_t = 85.47$  K,  $P_o = 7180$  bar, and  $\epsilon = 1.283$ .

(b) The Vapor Pressures. Data used for adjusting equation (2) appear in the first part of table 1. Other data appear in the continuation. At pressures below about 0.01 bar the noise-level is at least 5%. We estimate at least 10% uncertainty in our selected triple-point pressure. The equation used for ethane [28,29] gave negative curvature at the critical point with present propane data, which is wrong. We therefore developed the following, using arguments—



$$x(T) \equiv (T - T_t)/(T_c - T_t), \quad u(T) \equiv (1 - T_t/T)/(1 - T_t/T_c), \quad (2)$$

$$\ln(P/P_t) = a \cdot u + [b + c \cdot x + d \cdot x^2] \cdot x \cdot (1 - x)^\varepsilon,$$

$P_t = 3.0 \cdot 10^{-9} \text{ bar}$	$a = 23.372 \ 2838$
$T_t = 85.47 \text{ K}$	$b = 5.716 \ 6879$
$T_c = 369.80 \text{ K}$	$c = -8.511 \ 7071$
$\varepsilon = 1.30$	$d = 3.975 \ 8738$

The last column of table 1 gives the experimental residual,

$$Y(P,T) \equiv (y - u)/[x \cdot (1 - x)^\varepsilon], \quad (2a)$$

where

$$y(P) \equiv \ln(P/P_t)/\ln(P_c/P_t).$$

It is extremely sensitive to all parameters. When  $T_t$ ,  $T_c$ ,  $P_t$ ,  $P_c$ , and  $\varepsilon$  have been selected, a plot of  $Y$  vs.  $x$  suggests the form of polynomial needed to complete the vapor-pressure equation. As the "fit" of present data is sensitive to exponent  $\varepsilon$  in equation (2), we cannot adjust  $\varepsilon$  for a best "fit" of P-p-T data via the equation of state, as was performed for ethane [29].

### 2.3 The Orthobaric Densities

(a) The Saturated Liquid Densities. Data in table 2 include only modern, consistent measurements. For equation (3) define the variables —

$$x(T) \equiv (T_c - T)/(T_c - T_t), \quad y(\rho) \equiv (d - d_c)/(d_t - d_c),$$

when the equation for saturated liquid densities is —

$$y(\rho) = x + (x^\epsilon - x) \cdot [a + b \cdot x^2 + c \cdot x^3], \quad (3)$$

$$T_t = 85.47 \text{ K}$$

$$\epsilon = 0.35$$

$$T_c = 369.80 \text{ K}$$

$$a = 0.775 \ 3967$$

$$d_c = 4.96 \text{ mol/L}$$

$$b = -0.167 \ 9130$$

$$d_t = 16.62 \text{ mol/L}$$

$$c = 0.081 \ 1668$$

The last column of table 2 gives the experimental residual,

$$Y(\rho, T) \equiv (y - x)/(x^\epsilon - x). \quad (3a)$$

The polynomial on the right side of equation (3) was selected to describe the plot of  $Y$  vs.  $x$ .

(b) The Saturated Vapor Densities. Data in the first part of table 3 were used for adjusting equation (4). For ID = 1, the "data" are from our vapor-pressure and virial equations. Other data are given in the continuation of table 3. The triple-point vapor density in equation (4) is from the ideal gas law,  $d_g \equiv P_t/(R \cdot T_t)$ . Define the arguments —

$$x(T) \equiv (T_c - T)/(T_c - T_t), \quad u(T) \equiv (T_c/T - 1)/(T_c/T_t - 1),$$

and the dependent variable —

$$Y(d,T) \equiv \ln[d_c \cdot T_c / (d \cdot T)] / \ln[d_c \cdot T_c / (d_g \cdot T_t)],$$

when the equation for saturated vapor densities is —

$$Y = u + (x^\varepsilon - x) \cdot \sum_{i=0}^5 A_i \cdot x^i, \quad (4)$$

$T_t$	=	85.47 K	$A_1$	=	0.170 5345
$T_c$	=	369.80 K	$A_2$	=	-0.278 0602
$d_c$	=	4.96 mol/L	$A_3$	=	0.438 9823
$\varepsilon$	=	0.35	$A_4$	=	-0.841 0803
$A_0$	=	0.072 4533	$A_5$	=	0.405 1054

The last column of table 3 gives the experimental residual  $(Y - u)/(x^\varepsilon - x)$ . This is extremely sensitive to all parameters. Behavior approaching the triple-point temperature appears irregular.

#### 2.4 The Virial Equation

This equation of state usually is accurate at densities up to  $\rho_c/3$  when truncated as follows —

$$Pv/RT = 1 + B(T) \cdot \rho + C(T) \cdot \rho^2 + \dots \quad (5)$$

The second and third coefficients,  $B(T)$ ,  $C(T)$ , here are dimensionless through use of reduced density and temperature,  $\rho \equiv d/d_c$ ,  $x \equiv T/T_c$ . Data have been

collected in two excellent monographs [21,49]. Tables 4 and 5 compare selected data with the following fitting functions developed here for propane —

$$B(T) = B_1 + B_2/x + B_3/x^3, \quad (5a)$$

$$C(T) = (1 - T_o/T) \cdot [C_1/x + C_2/x^5], \quad (5b)$$

$d_c$	=	4.96 mol/L	$B_2$	=	-1.189913
$T_c$	=	369.80 K	$B_3$	=	-0.472695
$T_o$	=	343.375 K	$C_1$	=	0.214009
$B_1$	=	0.454061	$C_2$	=	4.836300

In present work, only the second coefficient has been used: to synthesize P- $\rho$ -T data for adjusting our equation of state, and to obtain saturated vapor densities via the vapor-pressure equation.

## 2.5 The Equation of State

Table 6 summarizes P- $\rho$ -T data reproduced here. They occur almost entirely in the single-phase domain of figure 1. Inclusion of the recent, unpublished data of Ely and Kobayashi [22] provides a dense coverage of the P( $\rho$ ,T) surface for propane at densities up to 15 mol/L, and temperatures down to 170 K.

The present type of equation of state has been explained in [27,28,29,30]. It is nonanalytic, yielding a maximum in specific heats  $C_v(\rho,T)$  at the critical point, (see figures 2 and 3, taken from [27]) —

$$P = P_{\sigma}(\rho) + \rho \cdot R^* \cdot [T - T_{\sigma}(\rho)] + \rho^2 R^* T_c \cdot F(\rho, T), \quad (6)$$

$$F(\rho, T) \equiv B(\rho) \cdot \Phi(\rho, T) + C(\rho) \cdot \Psi(\rho, T).$$

For any density, obtain the coexistence temperature  $T_{\sigma}(\rho)$  by iteration from equations (3) or (4) for the orthobaric densities. Place this in the vapor pressure equation (2) to obtain  $P_{\sigma}(\rho) \equiv P_{\sigma}[T_{\sigma}(\rho)]$ . Densities,  $\rho \equiv d/d_c$ , are reduced at the critical point. The gas constant for equation (6) therefore is redefined,  $R^* \equiv (0.0831434) \cdot d_c$ , bar/K.

The temperature-dependent functions in equation (6) are shown in figures 4 and 5 —

$$\Phi(\rho, T) \equiv x^{1/2} \cdot \ln[T/T_{\sigma}(\rho)], \quad (6a)$$

$$\Psi(\rho, T) \equiv \psi(\rho, T) - \psi_{\sigma}(\rho), \quad (6b)$$

where  $x \equiv T/T_c$ , and  $\psi_{\sigma}(\rho)$  is obtained from  $\psi(\rho, T)$  merely by replacing  $T$  with  $T_{\sigma}(\rho)$ ,

$$\psi(\rho, T) \equiv \delta/x + (1 - \delta) \cdot [1 - \omega + \omega \ln(\omega)], \quad (6c)$$

$$\omega(\rho, T) \equiv [1 - \Theta(\rho)/T].$$

The parameter  $0 \leq \delta \leq 1$  in equation (6c) is for relative weighting of the analytic and nonanalytic parts. The locus of temperatures inside the coexistence envelope [27] was shown in figure 3 —

$$\Theta(\rho) \equiv T_{\sigma}(\rho) \cdot \exp[-\alpha \cdot f(\rho)], \quad (6d)$$

$$f(\rho) \equiv |\rho - 1|^3 / (\rho_t - 1)^3,$$

where  $\rho_t \equiv d_t/d_c$  is a constant, and  $d_t$  refers to liquid at the triple point. The parameter  $\alpha$  is to be found by trial.

The density-dependent coefficients of equation (6) have been developed tediously by trial for propane, as shown in figure 6 —

$$B(\rho) \equiv B_1 + B_2 \cdot \rho + B_3 \cdot \rho^2 + B_4 \cdot \rho^3, \quad (6e)$$

$$C(\rho) \equiv C_1 \cdot (\rho - 1) \cdot (\rho - C_0) \cdot \exp(-\gamma \cdot \rho^4), \quad (6f)$$

where parameters  $C_0$  and  $\gamma$  are to be found by trial.

The parameters and coefficients of equation (6) for propane are —

$$\alpha = 1, \quad \gamma = 0.06, \quad \delta = 0.75,$$

$$B_1 = 0.2256 \ 6372 \ 605$$

$$B_4 = 0.1270 \ 8270 \ 211$$

$$B_2 = 1.0464 \ 6227 \ 554$$

$$C_0 = 2.0$$

$$B_3 = -0.4449 \ 1000 \ 068$$

$$C_1 = -0.5988 \ 3339 \ 489$$

Figure 2 and table 7 give behavior of coefficients  $B(\rho)$ ,  $C(\rho)$ . We have adjusted all parameters including  $d_c$ ,  $T_c$ , not only for a best fit of the

orthobaric densities, but also to obtain a well-behaved critical isotherm free of negative slopes, as shown in table 8. Figures 7 and 8 show that derived specific heats along the critical isochore agree with established experimental behavior very near the critical temperature [27].

The following, more highly constrained modification of the equation of state for propane has not been used in present work, but may be valuable in future investigations. With reference to figure 6, we have removed the possibility for an inflection in  $B(\rho)$ , demanding ethane-like behavior [28], and we have removed the second root in  $C(\rho)$ , forcing it, instead, to diminish strongly toward zero at high densities —

$$B(\rho) \equiv B_1 + B_2 \cdot \exp(\beta \cdot \rho),$$

$$C(\rho) \equiv C_1 \cdot (\rho - 1) \cdot \exp(-\gamma \cdot \rho^4),$$

$$\alpha = 1, \quad \beta = 0.7, \quad \gamma = 0.25, \quad \delta = 0.75,$$

$$B_1 = 0.3400 \ 1917 \ 213$$

$$B_2 = 0.3050 \ 4218 \ 746$$

$$C_1 = 0.7306 \ 3900 \ 769$$

The "fit" of  $P$ - $\rho$ - $T$  data with above coefficients is not quite as precise at low densities as with equation (6), due to the restriction on  $B(\rho)$ . At densities well above critical, however, the fit is equally precise.



## 2.6 The Ideal Gas Functions

Chao, et al. used spectroscopic data, and compared results for the specific heat with other sources [9]. A plot of their  $C_p^O(T)$  is linear at low temperatures, changing to the usual sigmoid shape at high temperatures, a behavior we could not represent analytically. We represent their enthalpies by use of the arguments  $x \equiv T/100$ ,  $u \equiv x^{1/3}$ ,

$$(H^O - H_O^O)/RT = 4 + \exp(-\epsilon/x) \cdot \sum_{i=0}^5 A_i/u^i, \quad (7)$$

where  $R = 8.31434 \text{ J/mol/K}$ ,  $\epsilon = 3$ , and —

$A_0 =$	24.11012	$A_3 =$	980.124 065
$A_1 =$	94.40550	$A_4 =$	-678.640 94
$A_2 =$	-585.32814	$A_5 =$	170.427 78

Specific heats are  $C_p^O(T) = dH^O/dT$ , but the entropies require numerical integration (SUBROUTINE IDEAL, Appendix C),

$$S^O(T) = S^O(300) + \int_{300}^T C_p^O \cdot dT/T, \quad (7a)$$

where  $S^O(300) = 32.552 \text{ J/mol/K}$ . Table 10 presents the data used for adjusting equation (7), and table 11 gives interpolated results from equation (7).

## 2.7 Specific Heats Along Isobar $P_b$

Table 12 compares Yesavage [69] data for  $C_p(T)$  at 1500 psi with our fitting function, equation (8). Deviations from simple functions were systematic over



small ranges of  $T$ , but irregular when viewed over the full range. We have been compelled to use a high-order polynomial, valid at temperatures no greater than 405 K. Define the argument  $x \equiv (T - T_t)/(T_m - T_t)$ , when —

$$C_p(T) = A_1 + \sum_{i=2}^9 A_i \cdot x^i, \text{ J/mol/K}, \quad (8)$$

$T_t$	=	85.47 K	$A_5$	=	-118 438.853
$T_m$	=	405.00 K	$A_6$	=	205 520.887
$A_1$	=	83.700	$A_7$	=	-210 152.230
$A_2$	=	719.296	$A_8$	=	116 726.413
$A_3$	=	-7 767.049	$A_9$	=	- 27 098.492
$A_4$	=	40 574.6955			

## 2.8 Specific Heats for Saturated Liquid

Table 13 gives sources of data for our fitting function, equation (9).

"Data" at ID = 30 were obtained by starting with Yesavage  $C_p(T)$  along isobar  $P_b = 1500$  psi, and then integrating down to the saturated liquid boundary by use of our equation of state. Define the argument  $x \equiv T/T_c$ , when —

$$C_o(T) = A_1 \cdot x / (1 - x)^\epsilon + \sum_{i=2}^5 A_i \cdot x^{i-2}, \text{ J/mol/K}, \quad (9)$$

where  $\epsilon = 0.8$ , and —

$$\begin{array}{ll}
T_c = 369.80 \text{ K} & A_3 = 18.313 \ 35 \\
A_1 = 4.201 \ 41 & A_4 = -36.564 \ 45 \\
A_2 = 79.737 \ 88 & A_5 = 67.003 \ 23
\end{array}$$

Deviations are given in table 13.

## 2.9 The Heats of Vaporization

Table 14 gives the "data," ID = 31, used for adjusting our fitting function, equation (10). These data were derived by computing around the critical point on paths  $T_b$ ,  $P_b$ ,  $T$  of figure 9. The continuation of table 14 gives "data," ID = 30, obtained from the Clapeyron equation, as well as experimental data.

A plot of these data shows that, at temperatures from 170 K down to the triple point, the ID = 31 data diverge upwards, and the ID = 30 data diverge downwards from a smooth extrapolation of the data at higher temperatures. By use of the argument  $x \equiv (T_c - T)/(T_c - T_t)$  we at first found a heat of vaporization at the triple point  $Q_{trp}$  by use of data ID = 31 at  $T \geq 170$  K and extrapolation via the monotonic formula,

$$Q_{vap} = a \cdot x + b \cdot x^\epsilon, \quad (\epsilon = 0.42).$$

Under constraint to this value for  $Q_{trp} = 23.906$  kJ/mol, we then adjusted constants in the equation —

$$Q_{vap}/Q_{trp} = x + (x^\epsilon - x) \cdot [a + b \cdot x^{1-\epsilon} + c \cdot x], \quad (10)$$

$$T_t = 85.47 \text{ K}$$

$$a = 0.983 \ 7347$$

$$T_c = 369.80 \text{ K}$$

$$b = 0.417 \ 5844$$

$$\epsilon = 0.38$$

$$c = -0.306 \ 7414$$

### 3. COMPUTATIONAL METHODS

The numerical values for  $E$  and  $H$  in this report are on the same absolute basis as those of Stearns and George [63], obtained by use of  $E_O^O = H_O^O = 27452.0$  J/mol. They obtained 18,589.67 J/mol for enthalpy of liquid at the normal boiling-point by integrating specific heats of Kemp and Egan [39].

#### 3.1 The Homogeneous Domain

The homogeneous domain of figure 9 includes all regions which can be attained along isotherms starting at zero density without crossing the vapor-liquid "dome," and without passing close to the critical point at  $T > T_c$ .

We start our computations with ideal gas thermodynamic functions at zero density, and then integrate along isotherms by use of the equation of state in the following relations,

$$\Delta E = \int [P - T \cdot (\partial P / \partial T)] \cdot d\rho / \rho^2, \quad (11)$$

$$\Delta C_v = - T \cdot \int (\partial^2 P / \partial T^2) \cdot d\rho / \rho^2, \quad (12)$$

$$\Delta S = R \cdot \ln[P^O / (\rho RT)] + \int [R - (\partial P / \partial T) / \rho] \cdot d\rho / \rho. \quad (13)$$

Equation (13) is for use with initial entropies in hypothetical ideal gas states at  $P^O = 1$  atm. For all other initial states we use —

$$\Delta S = - \int (\partial P / \partial T) \cdot d\rho / \rho^2. \quad (13a)$$

In each  $(\rho, T)$  state, reached by above integrations, we compute —

$$H = E + P \cdot v, \quad (14)$$

$$C_p = C_v + T \cdot (\partial P / \partial T)^2 / (\partial P / \partial \rho) / \rho^2, \quad (15)$$

$$W^2 = C_p \cdot (\partial P / \partial \rho) / C_v. \quad (16)$$

### 3.2 The Saturated Liquid

(a) At temperatures from the boiling point up to the critical point, we first obtain thermofunctions for the saturated vapor via equations (11) through (14). We then use equation (10) for the heat of vaporization,  $Q_{\text{vap}}$ , to compute —

$$\Delta H = - Q, \quad \Delta S = \Delta H / T, \quad (17)$$

such that the free energy of vaporization,  $\Delta F \equiv \Delta H - T \cdot \Delta S$ , is zero. Having obtained  $H$  and  $S$  for the saturated liquid, we compute  $E = H - P \cdot v$ .

The single-phase specific heat,  $C_v(\rho, T)$ , at the saturated liquid boundary is obtained via equation (9) for  $C_\sigma(T)$  and the thermodynamic relation [54],

$$C_v(\rho, T) = C_\sigma(T) + T \cdot (\partial P / \partial T) \cdot (d\rho_\ell / dT) / \rho_\ell^2, \quad (18)$$

where  $\rho_\ell$  is density of the saturated liquid. Values for  $C_p(\rho, T)$  and  $W(\rho, T)$  on this boundary follow from equations (15) and (16). For liquid at the boiling point we have obtained —

$$\begin{aligned} T_a &= 231.0707 \text{ K}, & H_a &= 18\,589.86 \text{ J/mol}, \\ E_a &= 18\,582.17 \text{ J/mol}, & S_a &= 170.8125 \text{ J/mol/K}. \end{aligned}$$

(b) At temperatures below the boiling point, down to the triple point, we start with  $E_a$ ,  $S_a$  for liquid at the boiling point, and then integrate along the saturated liquid path down to any temperature,  $T$ , by use of equation (9) for  $C_\sigma(T)$ ,

$$\Delta E = \int_{T_a}^T C_\sigma \cdot dT + \int_{T_a}^T P_\sigma \cdot d\rho_\ell / \rho_\ell^2 \quad (19)$$

$$\Delta S = \int_{T_a}^T C_\sigma \cdot dT/T \quad (20)$$

wherein  $P_\sigma(T)$  is the vapor pressure, and  $\rho_\ell$  is density of the saturated liquid. Values for  $H$ ,  $C_v$ ,  $C_p$  and  $W$  then are obtained as in paragraph (a) above.

### 3.3 The Compressed Liquid

Starting with above values for  $E$ ,  $S$ , and  $C_v$  on the saturated liquid boundary, we use equations (11), (12), and (13a) to integrate along isotherms, and then obtain  $H$ ,  $C_p$ , and  $W$  via equations (14), (15), and (16).

### 3.4 The Supercritical Shadow

The integration of equation (12) along the critical isotherm of figure 9 cannot be carried through the critical point, because  $|\partial^2 P / \partial T^2|$  approaches infinity at densities just below and above  $\rho_c$ . The accuracy of other derivatives from the equation of state may be low, very near the critical point.

At temperatures  $T_c \leq T < T_b$ , therefore, we establish a shadow on figure 9 at densities  $\rho > \rho_c$ . For this region we compute thermofunctions along paths  $T_b, P_b, T$ . At the point  $(T_b, P_b)$  we have obtained the values ( $T_b = 405$  K,  $P_b = 103.42135$  bar,  $d_b = 7.3637$  mol/L),

$$\begin{aligned} H_b &= 40,454.53 \text{ J/mol}, \\ S_b &= 236.9352 \text{ J/mol/K}, \\ (C_p)_b &= 170.71 \text{ J/mol/K}. \end{aligned}$$

The "experimental" value of  $C_p$  from equation (8) is 168.37 J/mol/K at this point.

From point  $(T_b, P_b)$  of figure 9 we integrate along isobar  $P_b$  down to any  $T$  by use of equation (8),

$$\Delta H = \int C_p \cdot dT, \quad \Delta S = \int C_p \cdot dT/T \quad (21)$$

At any point  $(T, P_b)$ ,  $E = H - P \cdot v$ , and  $C_v$  is obtained via equation (8) and equation (15). The final path of integration is along any isotherm,  $T$ , by use of equations (11), (12), and (13a). We finally apply equations (14), (15), and (16).



## 4. TESTS AND COMPARISONS

### 4.1 The P- $\rho$ -T Compressibility Data

Detailed deviations appear in table 9. Figure 10 shows relative deviations of experimental densities from the smooth  $P(\rho, T)$  surface of equation (6). In the critical region,  $T = T_c \pm 5\%$ ,  $\rho = \rho_c \pm 50\%$ , small inconsistencies in the pressure and temperature scales of different laboratories are expected to give large deviations of density because the derivatives  $(\partial\rho/\partial T)$  and  $(\partial\rho/\partial P)$  are approaching infinity at the critical point. At the other extreme, the derivative  $(\partial P/\partial\rho)$  becomes very large for compressed liquid at low temperatures, such that small relative errors in the experimental densities yield (via any equation of state) deviations of the calculated pressures greatly exceeding the accuracy of pressure measurements. In this domain, any equation of state should be used only to find  $\rho(P, T)$ .

### 4.2 Specific Heats, $C_p(\rho, T)$

Detailed deviations appear in tables 15 and 16. Figure 11 shows relative deviations of the data of Ernst, et al. [23] from our calculated specific heats for gaseous states at subcritical densities. The differences of roughly 0.5% persist down to zero pressure, table 15, and therefore constitute a difference from the ideal gas values of Chao, et al. [9].

Figure 12 shows relative deviations of the data of Yesavage [69] from our calculated specific heats. Except near the critical point, most deviations are under 1%. Figures 13 and 14 show excellent agreement near the extrema along isobars just below, and just above the critical pressure.

### 4.3 Speeds of Sound, $W(\rho, T)$

The first part of table 17 for the saturated liquid compares speeds of sound from Rao [50] with our calculated results. He gave only values calculated by a linear dependence on  $T$ , not reported. We reconstituted a linear formula to regenerate his "data." These "data" are uniformly about 12% lower than our results. We believe it unlikely that our results are this far in error.

The second part of table 17 gives speeds of sound measured by Lacam [42]. Figure 15 shows that, with a few exceptions, the deviations are under 2%.

### 4.4 Enthalpy Differences at 60 Bar

Table 18 compares our enthalpy differences along the 60 bar isobar with results of Kuloor, et al. [41] along their 60 atm isobar. Differences must be expected from the different ideal gas functions used, slightly different heats of vaporization, different equations of state based on different  $P$ - $\rho$ - $T$  data, and different computational paths and procedures.

This table, therefore, gives a rough indication of uncertainties which arise from these many sources when computing a thermodynamic network.

Differences of enthalpy between 1 atm and 1 bar, (1 atm = 1.01325 bar) are insignificant relative to the differences in  $\Delta H$  between Kuloor, et al., and this report.

### 4.5 Enthalpy Difference at 400 K

Table 19 compares our enthalpy decrease along the 400 K isotherm with results of Kuloor, et al. [41], and of Eubank, et al. [24]. At pressures below the critical isochore at 66.756 bar, differences must arise from the different equations of state used for this computation, assuming that the different computational procedures in each case are equivalent.



Present results up to 44 bar fall between those of Kuloor and of Eubank. At higher pressures, our decreases are about 1% smaller than Kuloor, and 1.5% smaller than Eubank.

At pressures above 66.756 bar, our enthalpies for table 19 were obtained by computation around the critical point, as shown by figure 9. On this path we obtained a heat of vaporization at the normal boiling point of 18864 J/mol, 0.45% greater than the experimental value,  $18780 \pm 17$  J/mol measured by Kemp and Egan [38]. Eubank, et al. exceed our enthalpy decrease by 262 J/mol at 400 K up to 100 bar. On the similar path, this would lead to a heat of vaporization about 1.8% greater than experimental.

#### 4.6 Residual Specific Heats at 400 K

Table 20 compares our derived, residual specific heats,  $C_p^* \equiv C_p(\rho, T) - C_p^O(T)$ , along the 400 K isotherm, with results of Kuloor, et al. [41], and of Eubank, et al. [24]. Agreement is fair for this difficult computation at densities up to the critical isochore at 66.756 bar, with exception of our smaller value at  $P = 1$  bar. At higher pressures, present results are near those of Kuloor, et al. Specific heats of Eubank, et al. are much greater than ours. The experimental value from Yesavage [69] at  $T = 399.8$  K,  $P = 103.42$  bar, is  $C_p^* = 70.5$  J/mol/K, obtained by use of our  $C_p^O(400) = 93.9$  J/mol/K.

#### 4.7 Loop Closure for the Saturated Vapor

Starting with enthalpy and entropy of the saturated liquid at temperatures below the boiling point [section 3.2(b)], we have used heats of vaporization from the Clapeyron equation,  $Q_{vap} = T \cdot (dP_\sigma/dT) \cdot (v_g - v_\ell)$ , to compute  $H$  and  $S$  of the saturated vapor.

In table 21 these results are compared with  $H$  and  $S$  computed for the vapor via ideal gas values and the equation of state. Inconsistencies increasing to almost 10% of the heat of vaporization at the triple point are seen in this table. This difficulty is anticipated, considering an uncertainty of at least 10% in vapor pressures and vapor densities.

When specific heats for ideal gas states and also for the saturated liquid are known, together with one heat of vaporization, it is possible in principle to utilize the Clapeyron and virial equations to deduce vapor pressures, as described recently by Cheng-Hsiung Tsai [67], following methods of Ziegler, et al. [73].

In this work, Cheng-Hsiung Tsai was not aware of the specific heats for saturated liquid, and the heat of vaporization of Kemp and Egan [39]. Ideal gas specific heats of Chao, et al. [9] appeared later than his work. This noble enterprise therefore should be repeated with recent data. For reference, however, we compare results of Tsai with our vapor pressures from equation (2) in table 22, and with our heats of vaporization from equation (10) in table 23.

In the last column, of the first page of table 29, we give heats of vaporization at temperatures below the boiling point calculated as the difference of vapor and liquid enthalpies,  $Q_{\text{vap}} = H_g - H_l$ , where  $H_g$  was obtained from ideal gas properties via the equation of state.

After the present report was completed, we derived data for vapor pressures, densities of the saturated vapor, and for heats of vaporization by similar methods at temperatures below the normal boiling point. Primary data used are specific heats for ideal gas states, equation (7), the heat of vaporization,  $Q_b$ , at the normal boiling point,  $T_b$ , [39], specific heats for the saturated

liquid equation (9), and the virial equation of state (5). Secondary data used are our approximate vapor-pressures, equation (2), and the saturated liquid densities, equation (3).

At any temperature,  $T_a$ , there are two unknown variables, the vapor pressure,  $P$ , and the heat of vaporization,  $Q_a$ . Closed-loop computations for enthalpy and for entropy, yield

$$Q_a = Q_b + \Delta H_\ell(a,b) - \Delta H_g(a,b)$$

$$\Delta S_a = Q_b/T_b + \Delta S_\ell(a,b) - \Delta S_g(a,b)$$

We iterate  $P$  to minimize the free energy change at  $T = T_a$ ,

$$\Delta F_a = Q_a - T_a \cdot \Delta S_a = 0.$$

Well-known relations have been used with the virial equation to compute  $\Delta H_g(a,b)$  and  $\Delta S_g(a,b)$ , and to obtain  $\Delta H_\ell(a,b)$ ,  $\Delta S_\ell(a,b)$  via the saturated liquid specific heats  $C_\sigma(T)$ , all as detailed in PROGRAM ZIEGLER, given at the end of Appendix C.

Table 24 gives results via  $Q_b = 18\,780$  J/mol of Kemp and Egan. Table 25 gives results via  $Q_b = 18\,864$  J/mol used in the present report. Under the heading P,EQN are given vapor pressures from our equation (2). The heading P,BAR is for pressures derived by iteration. The heading MOL/L is for saturated vapor densities via the virial equation (5). The heading Q,EQN is for heats of vaporization via our equation (10), whereas heading Q,VAP is for the derived heats of vaporization.

## 5. TABLES OF PHYSICAL AND THERMODYNAMIC PROPERTIES

### 5.1 Calculated P- $\rho$ -T Isochores and Isotherms

Tables 26 and 27 give a selection of isochores and isotherms computed by equation of state (6). These are essential to examine behavior of the P( $\rho$ ,T) surface. They are a useful supplement to the isobars of table 30 for interpolating P- $\rho$ -T values and their derivatives.

### 5.2 The Joule-Thomson Inversion Locus

Table 28 gives the P- $\rho$ -T locus of the J.-T. inversion,  $(\partial T/\partial P)_H = 0$ , obtained from equation of state (6) under the condition  $T \cdot (\partial P/\partial T) = \rho \cdot (\partial P/\partial \rho)$ . This table has been computed to temperatures well above those of P- $\rho$ -T data, to find the maximum in P-T coordinates.

### 5.3 Thermophysical Properties of the Saturated Liquid

Table 29 gives physical and thermodynamic properties of saturated liquid propane computed by methods of section 3. Column headings are interpreted on the first page of this table.

### 5.4 Thermophysical Properties Along Selected Isobars

Table 30 gives physical and thermodynamic properties on isobars, computed by methods of section 3. Explanations for this table are given on the first page. This table is extrapolated beyond the maximum temperature (600 K), and the maximum pressure ( $\sim 400$  bar) of most of the P- $\rho$ -T data used for adjusting the equation of state.

## 6. COMMENTS AND RECOMMENDATIONS

### 6.1 Comments on Uncertainties

Kuloor, Mewitt, and Bateman give an excellent discussion of problems in estimating "accuracy" in a thermodynamic network [41].

Densities from the equation of state in most regions of the  $P(\rho,T)$  surface here are within 0.2% of experimental data, tables 6 and 9. Much of the  $P$ - $\rho$ - $T$  data of Beattie, Kay, and Kaminsky [2], however, fall in or near the critical region where any small inconsistencies in the temperature or pressure scales necessarily give large density deviations, especially with an equation of state which originates on the coexistence boundary, as discussed in section 4.1. We estimate uncertainty of densities in table 30 (isobars) to be under 0.2%, except in the critical region where it increases toward 2% near the critical point.

Heats of vaporization, used to cross the "dome" of figure 9, we estimate uncertain by under 0.5%, table 14. At the boiling point, this is under 90 J/mol, which then applies to enthalpies in the compressed liquid at 231 K.

Enthalpy differences along isobars in table 30 in general agree with experimental specific heats of Yesavage [69] within 3%, which we assess as uncertainty for  $\Delta H$  over small ranges. Enthalpy differences from points in the compressed liquid at low temperatures have the increased uncertainties discussed above.

Tables 18, 19, and 20 give an indication of differences among authors using different data and methods.

### 6.2 Recommendations

1) The melting line,  $P_m(T)$ , of Reeves, Scott, and Babb was uncertain by at least 1 K in temperature [52]. This corresponds to an enormous uncertainty



in pressure. Experimental determination of this boundary of the  $P(\rho, T)$  surface is relatively easy in conventional  $P$ - $\rho$ - $T$  apparatus, and is desirable.

2) Vapor-Pressure data for propane are of low precision, table 1. Accurate measurements from a single laboratory on a pure sample of propane from the lowest possible pressure [e.g., 0.1 bar via the "air dead-weight gage"] to the critical pressure would be valuable for thermal computations. At very low temperatures, new experimental techniques are needed for pressures down to  $3 \cdot 10^{-9}$  bar at the triple-point.

3) Saturated liquid densities from different sources are consistent and of high precision, table 2. No further measurements are needed.

4) Saturated vapor densities always are difficult to measure or derive with good accuracy. Table 3 shows available data. For an equation of state which originates on the coexistence boundary, higher confidence and accuracy is needed for the vapor densities, all the way down to the triple point where this density is about  $10^{-10}$  mol/L.

The present equation of state (6) appears to be well suited for obtaining coexistence densities from sets of  $P(T)$  data along isochores. Assume that parameters  $T_c$ ,  $\rho_c$ ,  $\alpha$ ,  $\gamma$ ,  $\delta$  are known from preliminary work. For data at a constant density, we need only treat  $T_G(\rho)$  as an unknown parameter in equation to be found by trial or iterative procedures for a best fit of the data. The coefficients  $B(\rho)$ ,  $C(\rho)$  may be used as least-squares coefficients, or taken as constants (at this density) from previous work.

It follows that a complete set of accurate and self-consistent  $P$ - $\rho$ - $T$  data on isochores (or isotherms), from the lowest possible densities up to at least the critical density, would be most helpful both for a reanalysis of virial

coefficients, and to obtain the saturated vapor densities. The older data of Beattie, et al. [2] probably need unknown adjustments of the temperature scale.

5) The virial coefficients for propane at low temperatures are important because the virial and vapor-pressure equations provide a means to estimate saturated vapor densities at values down to about  $10^{-10}$  mol/L near the triple-point. Measurable virial coefficients for propane at higher temperatures are of low precision, tables 4 and 5. Methods for accurate extrapolation to lower temperatures need to be investigated.

6) The equation of state used here requires accurate and consistent data for the liquid-vapor coexistence boundary, namely the vapor-pressure equation and orthobaric densities. Experimental  $P$ - $\rho$ - $T$  data (used to adjust coefficients in the equation of state) are lacking for propane only in the compressed liquid at temperatures from 170 K down to the triple point (85 K). Any new data in the critical region, we believe, would be useful only if both highly accurate and consistent with our temperature and pressure scales. With the present, highly-constrained equation of state, excessive numbers of  $P$ - $\rho$ - $T$  data points are not needed. Greater absolute accuracy in a smaller number of carefully-chosen points would be preferable. Many points along isochores and/or isotherms nevertheless are needed for any new substance to estimate the coexistence boundary by classical methods.

7) Specific heats for ideal gas states, estimated from spectroscopic data [9], might well be modified in future work on propane by inclusion of the calorimetric data of Ernst, et al. [23].

8) Specific heats  $C_p(\rho, T)$ , or  $C_v(\rho, T)$  are essential data for computing a thermodynamic network. Whereas we have obtained reasonably consistent, closed-loop

results with data of Yesavage [69], more accurate data would be helpful, because small relative uncertainties lead to large absolute uncertainties in tabulated enthalpies. For closed-loop computation around the critical point, figure 9, specific heats  $C_p(\rho, T)$  at constant pressure are most convenient for entering the compressed liquid region, all the way down to the triple-point temperature, although these measurements are much more difficult experimentally than those for  $C_v(\rho, T)$  at constant density.

9) Accurate specific heats,  $C_O(T)$ , for the saturated liquid have been measured only at temperatures below the normal boiling point [39]. Table 13 shows poor precision for the few data at higher temperatures. Data over the full range of the coexistence boundary are valuable for many alternative procedures and consistency tests in a thermodynamic network. Determination of these data from specific heat observations on a liquid-vapor sample at constant volume requires accurate knowledge of the vapor-pressure and saturated-liquid-density equations.

10) Heats of vaporization for propane at temperatures above the normal boiling point are not highly precise, table 14. Very high relative accuracy is needed in new experimental data because the large absolute heats of vaporization lead to large absolute uncertainties in enthalpy for the saturated liquid. Research similar to that of Ziegler, et al. [73] should be conducted for consistency of vapor pressures and heats of vaporization at very low temperatures where adequate experimental methods do not exist. See section 5.3, above.

11) In conclusion, more experimental data are available for propane than was anticipated at the start of present work. Further computational work could be performed to make the best possible, self-consistent thermodynamic network



from these, available data. As with all such problems, however, more accurate data for nearly all physical properties is desirable, because the thermodynamic properties (enthalpies) in many regions are extremely sensitive to the physical properties used. A particular, unsolved problem for the higher hydrocarbons is the long, liquid-vapor range below the normal boiling point, where vapor pressures, vapor densities, and heats of vaporization cannot be measured accurately by current, experimental techniques.

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## APPENDIX A. Symbols and Units

Subscripts  $c$  and  $t$  refer to critical and liquid triple points.

Subscripts  $g$  and  $l$  refer to saturated vapor and liquid.

Subscript  $\sigma$  refers to liquid-vapor coexistence (usually the liquid).

Superscript  $o$  refers to ideal gas states.

$\alpha, \gamma, \delta,$	non-linear constants in the equation of state
$B(\rho), C(\rho)$	density-dependent coefficients in the equation of state
$B(T), C(T)$	second and third virial coefficients
$C_v(\rho, T)$	molal heat capacity at constant volume, (J/mol)/K
$C_p(\rho, T)$	molal heat capacity at constant pressure, (J/mol)/K
$C_\sigma(T)$	molal heat capacity for saturated liquid, (J/mol)/K
$d$	density, mol/L
$E(\rho, T)$	the internal energy, J/mol
$E_\sigma^o$	27, 452.0 J/mol
$f(\rho)$	used in the definition of $\Theta(\rho)$
$F(\rho, T)$	definition in the equation of state
$H(\rho, T)$	the enthalpy, J/mol
$J$	the joule, 1 N-m
$L$	the liter, $10^{-3} \text{ m}^3$
mol	44.09721 grams of propane ( $C^{12} = 12$ scale)
$P$	pressure in bars, 1 bar = $10^5 \text{ N/m}^2$ , (1 atm = 1.01325 bar)
$P_\sigma(T)$	the vapor pressure, bar
$P_\sigma(\rho)$	$P_\sigma[T_\sigma(\rho)]$ , vapor pressure as function of density
$\Phi(\rho, T)$	function in the equation of state
$\Psi(\rho, T)$	function in the equation of state
$Q_{\text{vap}}$	$\Delta H_{\text{vap}}$ , the heat of vaporization, J/mol

$R$	the gas constant, 8.31434 (J/mol)/K, 0.0831434 (bar-L/mol)/K
$\rho$	$d/d_c$ , density reduced at the critical point
$S(\rho, T)$	the entropy, (J/mol)/K
$T$	temperature, K
$T_b$	405.0 K, (figure 1)
$T_\sigma(\rho)$	liquid-vapor coexistence temperature, K
$\Theta(\rho)$	defined locus of temperatures
$v$	$1/d$ , molal volume, L/mol
$\omega(\rho, T)$	$[1 - \Theta(\rho)/T]$ for the equation of state
$W(\rho, T)$	the speed of sound, meters/second
$x(T)$	$T/T_c$ for the equation of state
$x(T)$	variously defined for other equations
$x_\sigma(\rho)$	$T_\sigma(\rho)/T_c$ , reduced temperature at coexistence, for the equation of state.

APPENDIX B. Fixed-Point Values for Propane

	<u>Triple Point</u>	<u>Boiling Point</u>	<u>Critical Point</u>
Temperature, K	85.47	231.071	369.80
Pressure, bar	$3.0 \cdot 10^{-9}$	1.01325	42.4204
Density, mol/L			4.96
Vapor	$4.22 \cdot 10^{-10}$	0.05485	
Liquid	16.620	13.168	

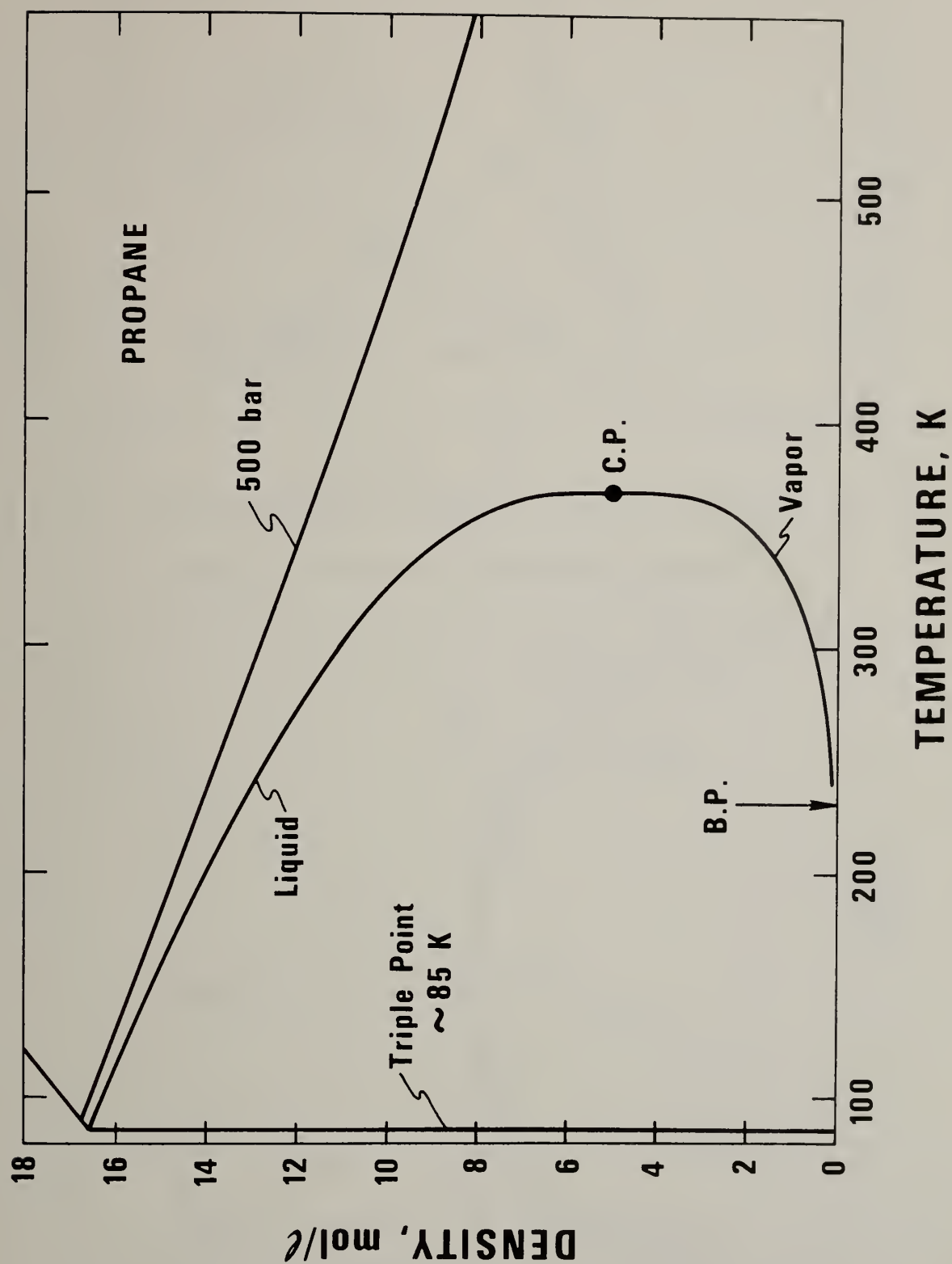


Figure 1. Density-temperature diagram of propane.

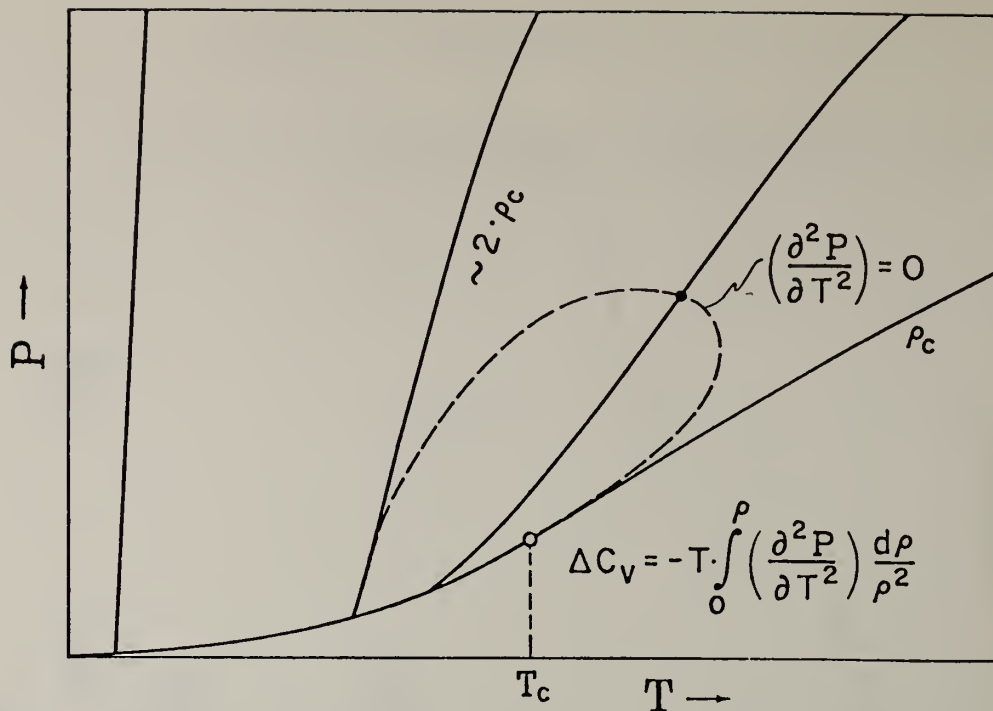


Figure 2. The locus of isochore inflection points.

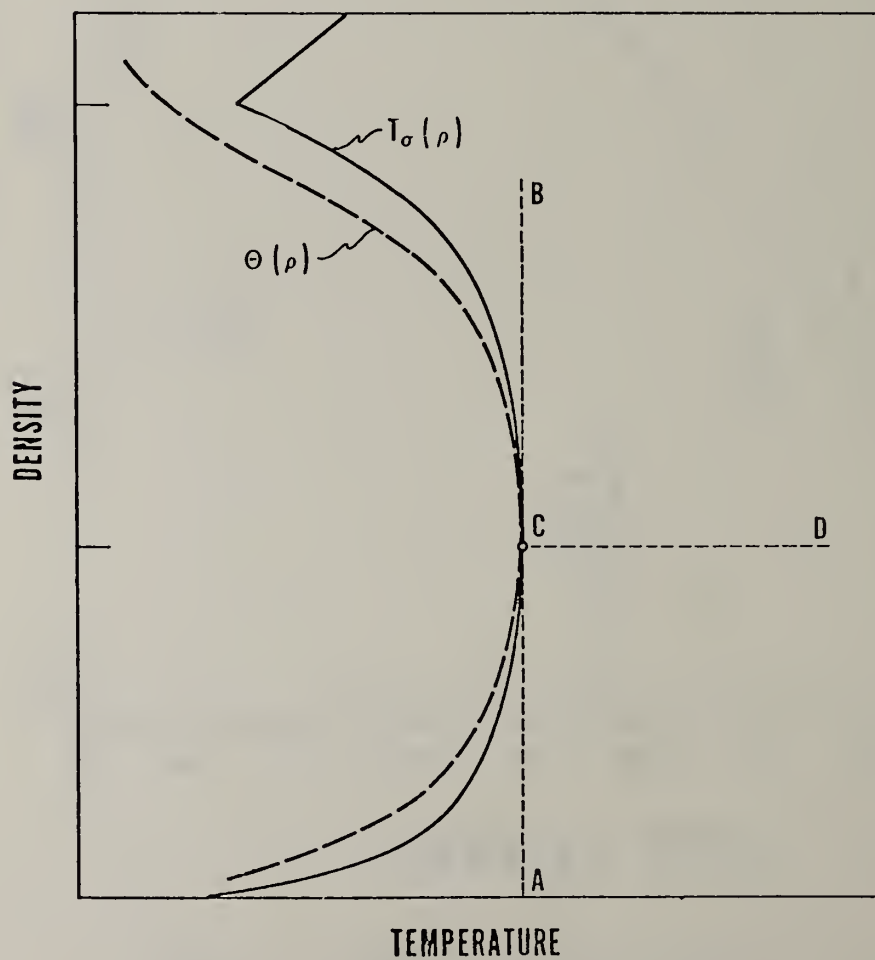


Figure 3. Behavior of the locus  $\Theta(\rho)$ .



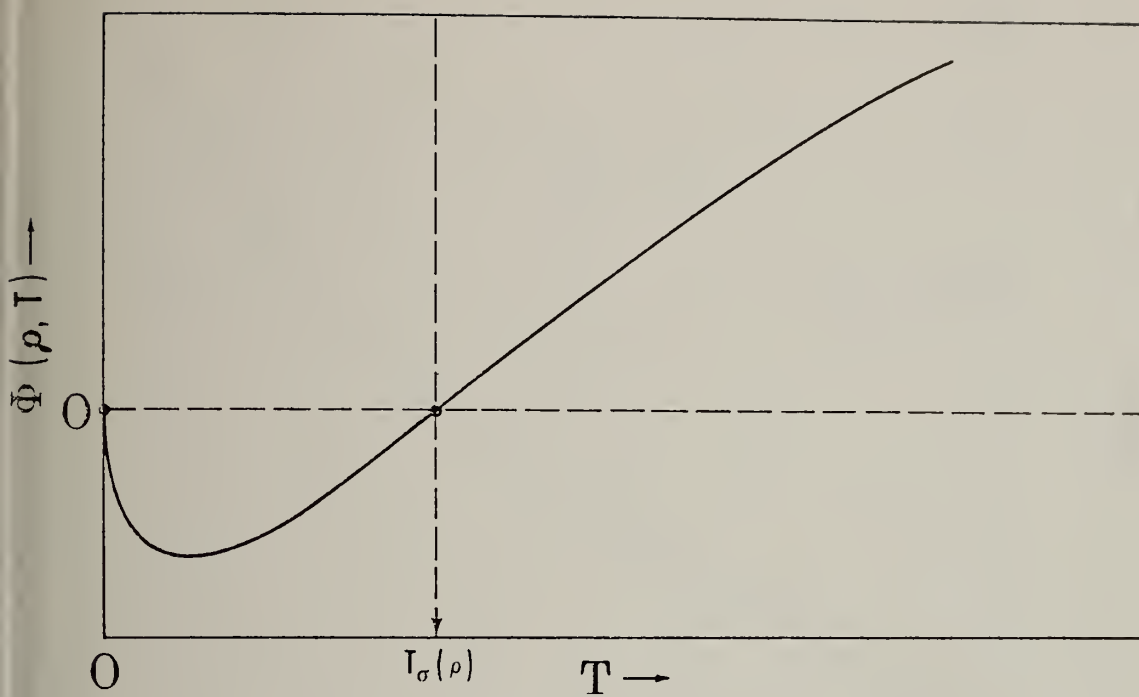


Figure 4. Behavior of the function  $\Phi(\rho, T)$ .

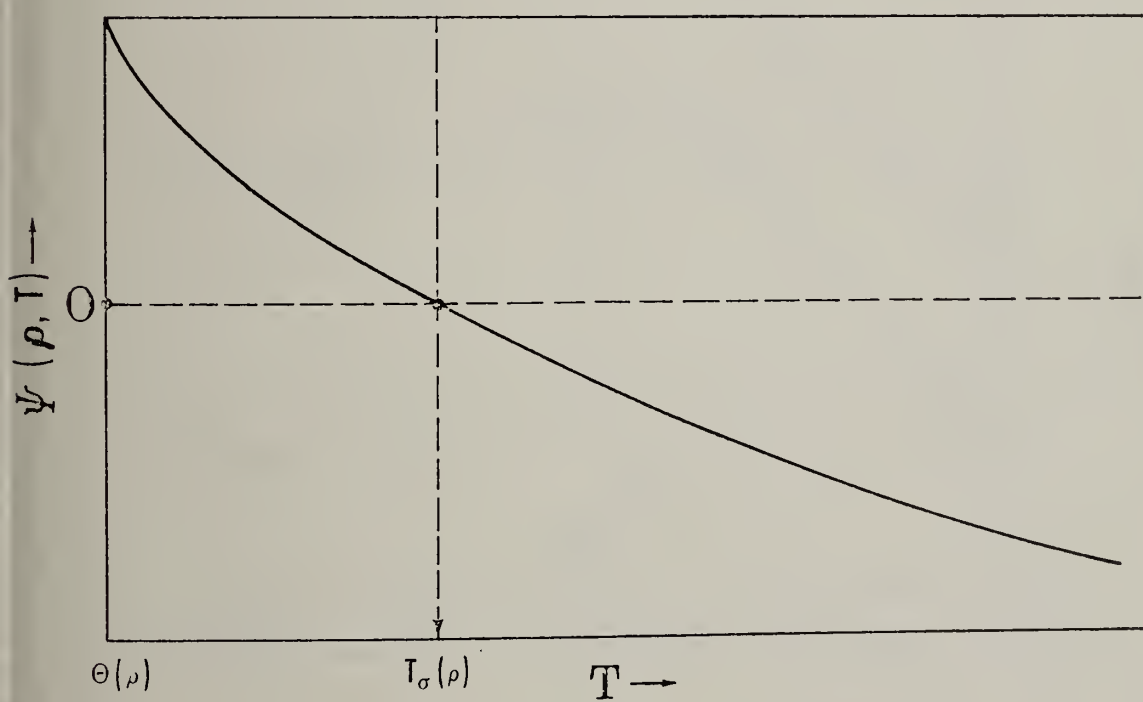


Figure 5. Behavior of the function  $\Psi(\rho, T)$ .

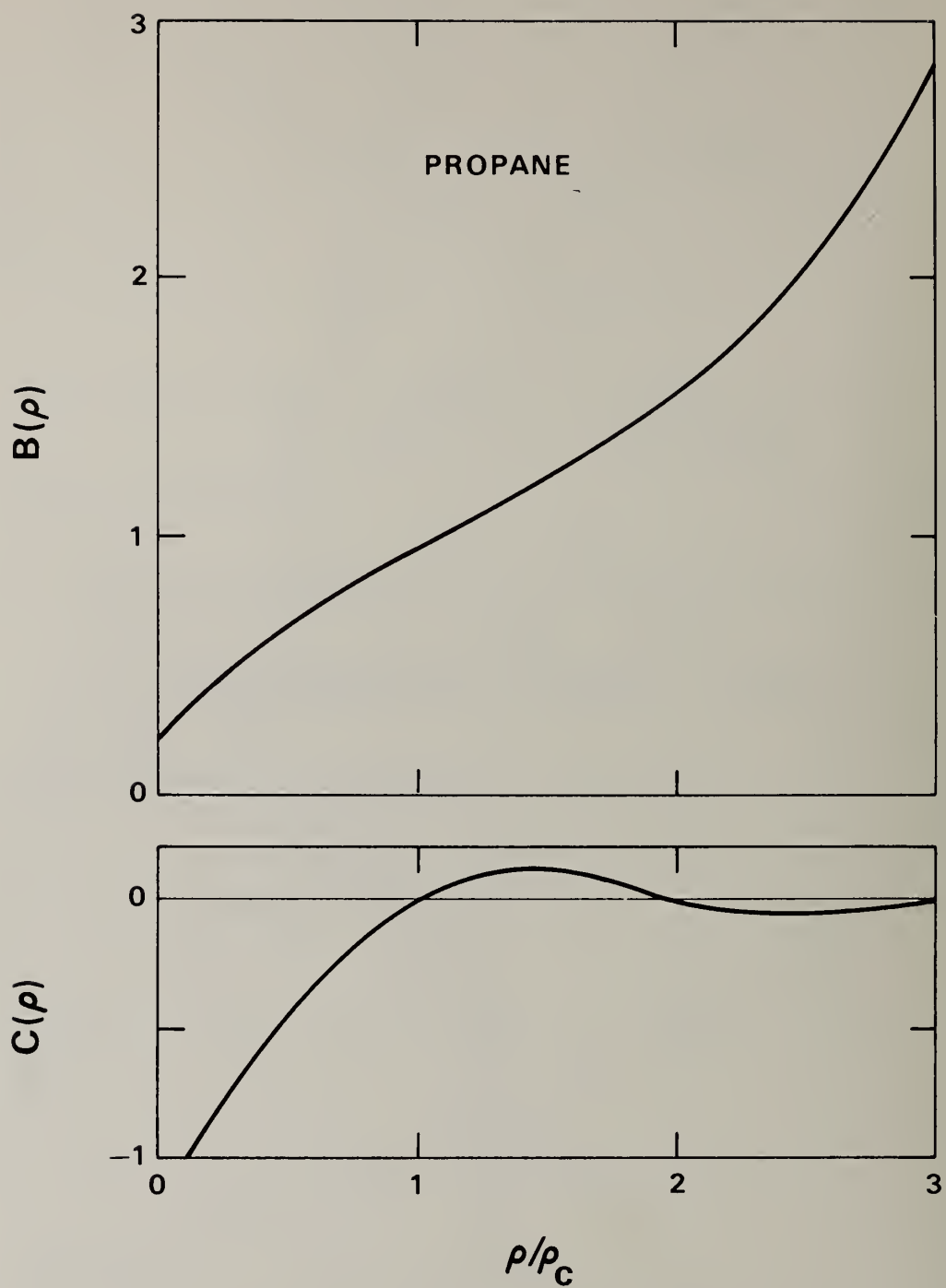


Figure 6. Behavior of coefficients  $B(\rho)$ ,  $C(\rho)$  for propane.

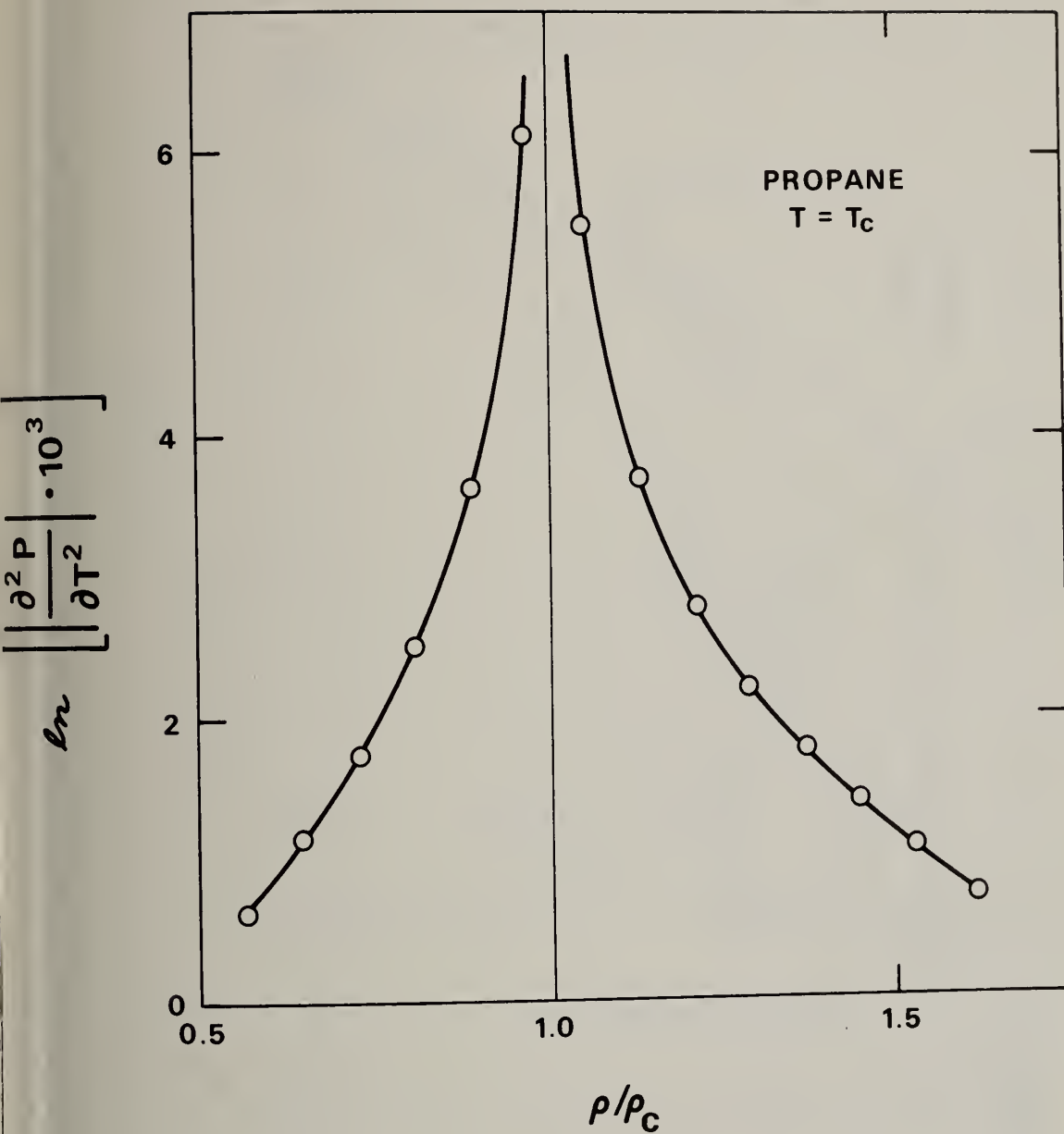


Figure 7. Behavior of  $\partial^2 P / \partial T^2$  on the critical isotherm.

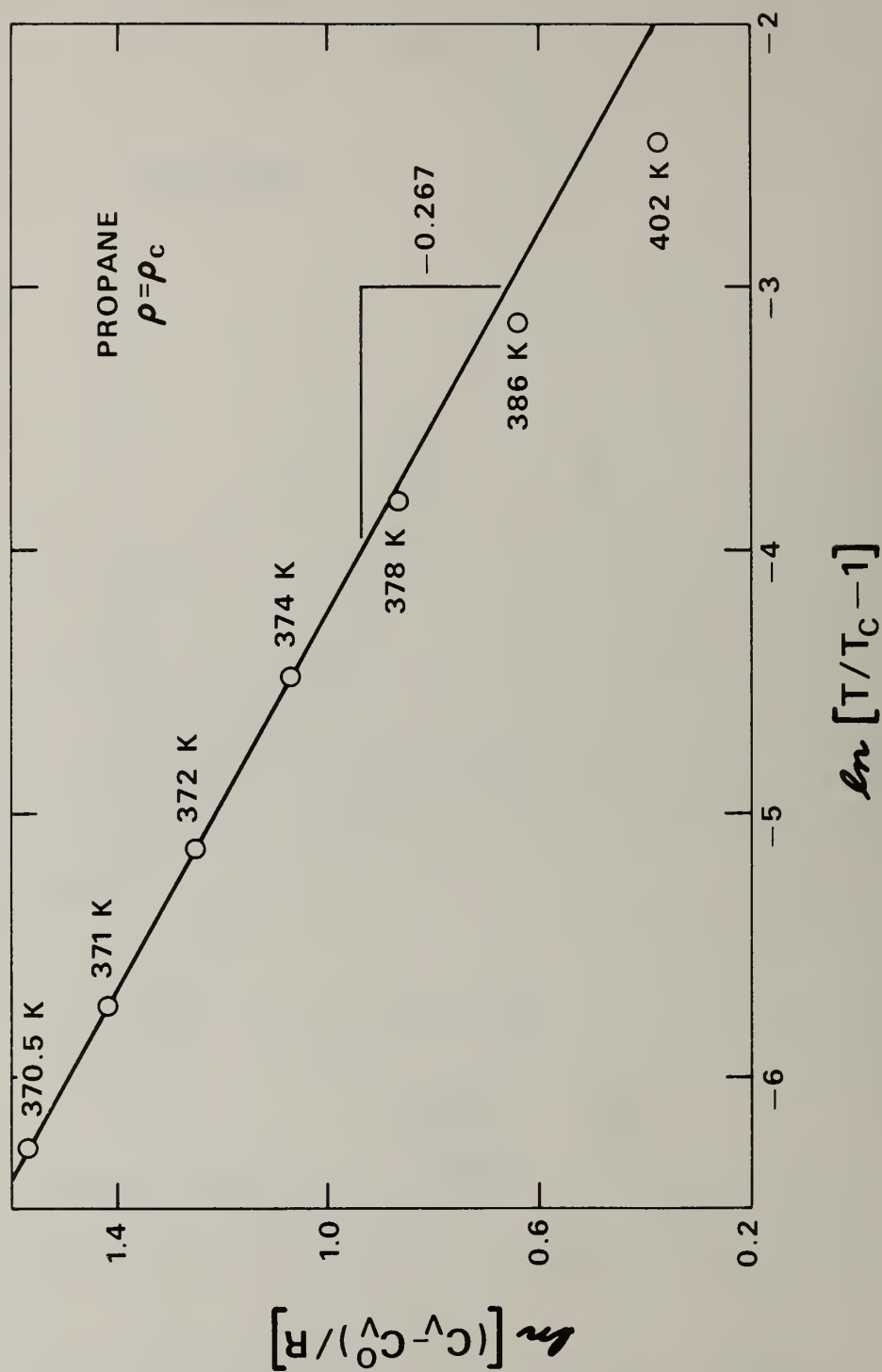


Figure 8. Behavior of  $C_v(T)$  on the critical isochore.

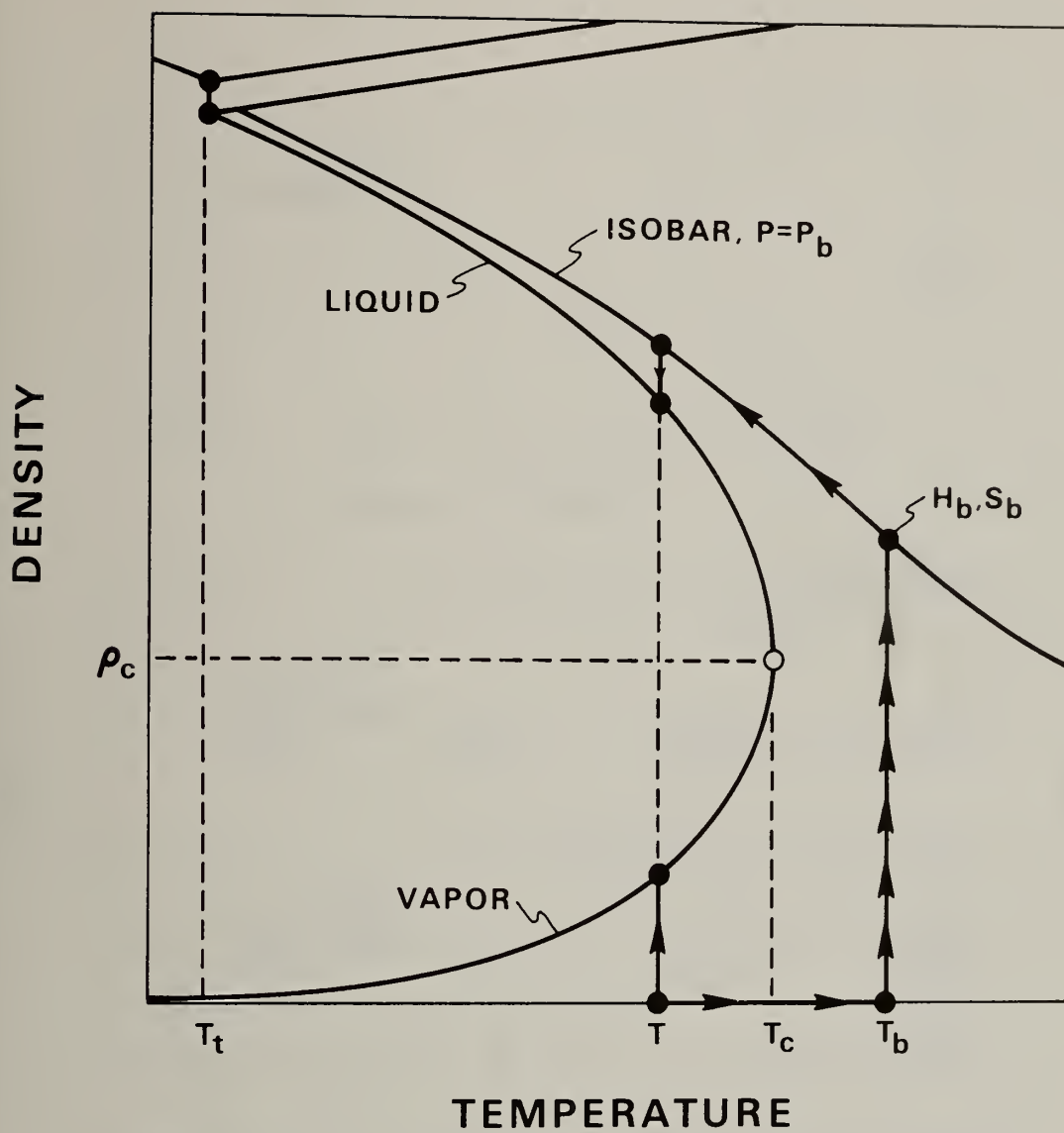


Figure 9. Paths used to derive heats of vaporization.

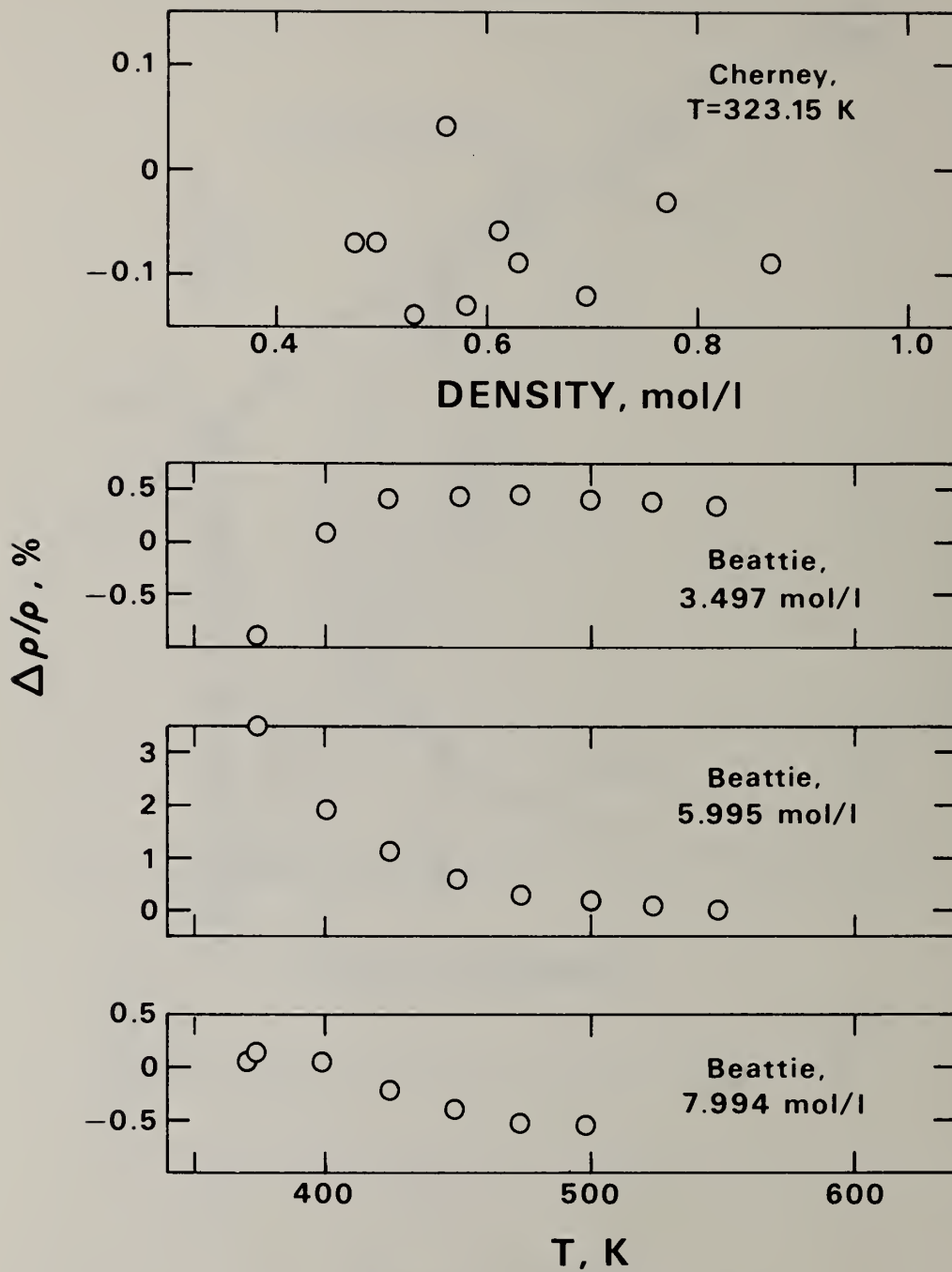


Figure 10. Deviation plots for densities.



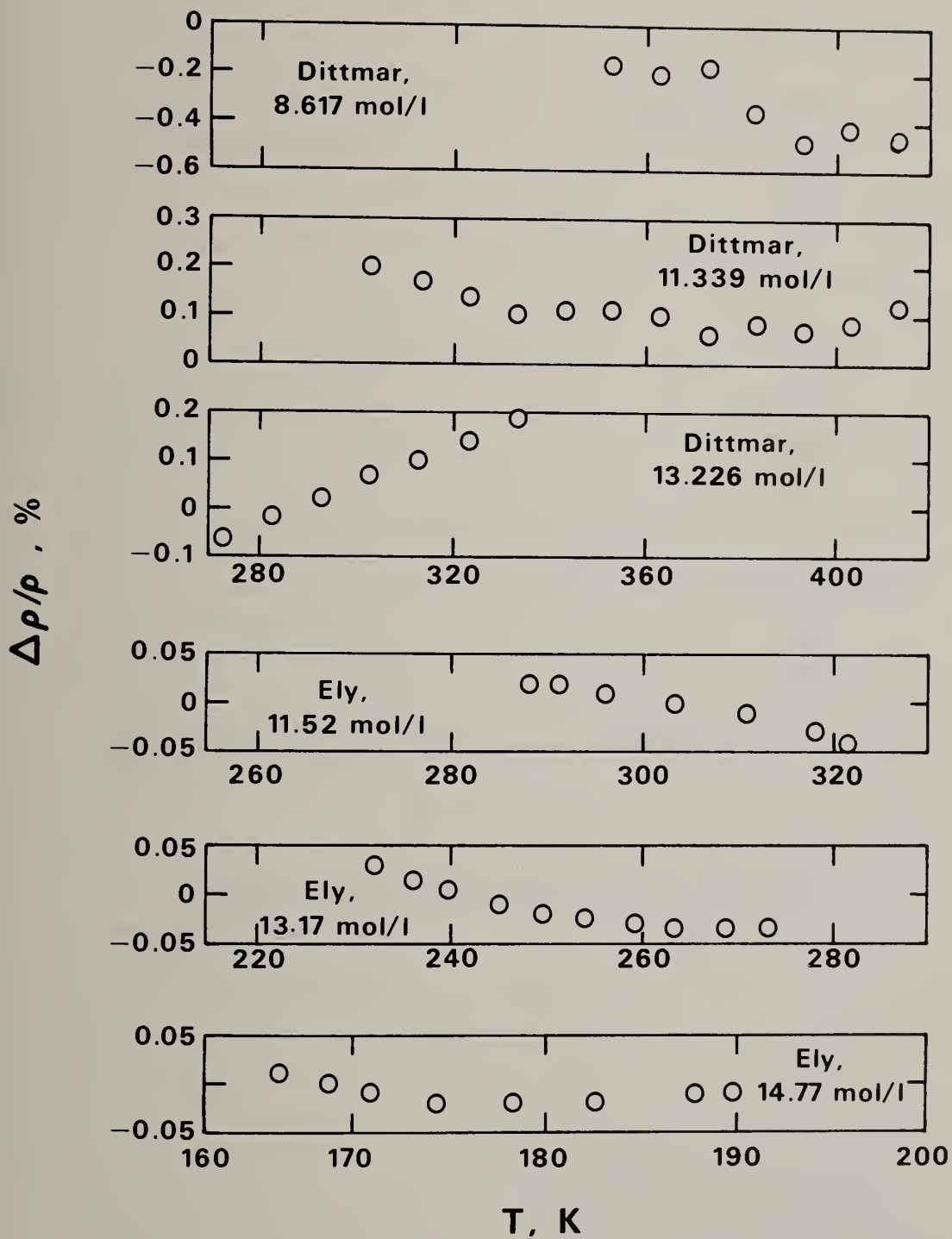


Figure 10. Deviation plots for densities (continued).

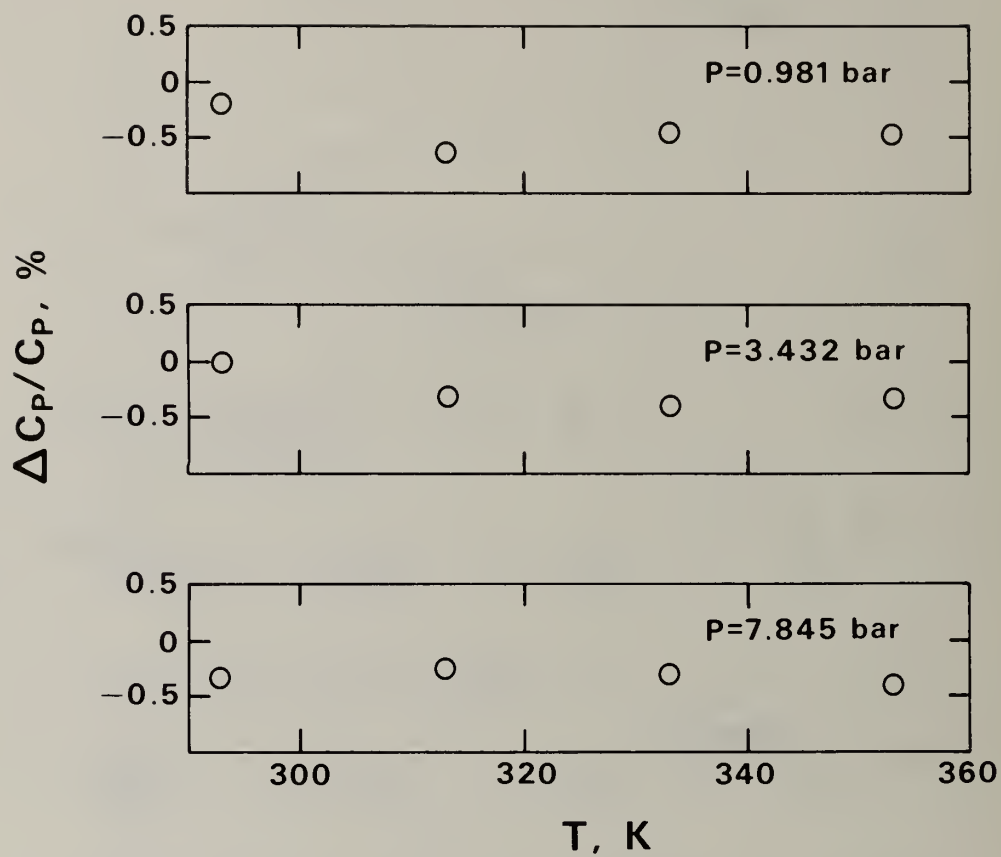


Figure 11. Deviations of Ernst specific heats.

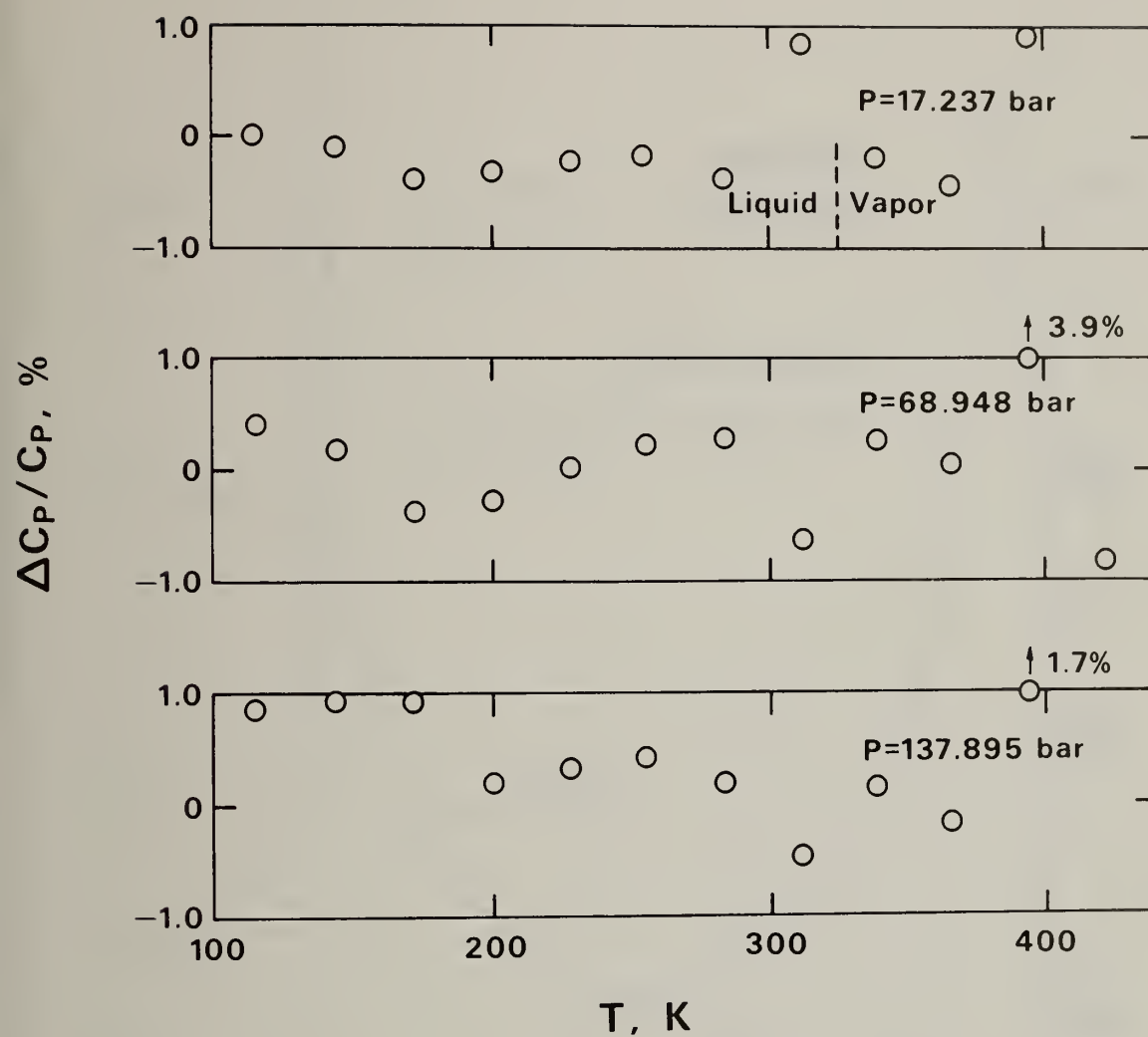


Figure 12. Deviations of Yesavage specific heats.

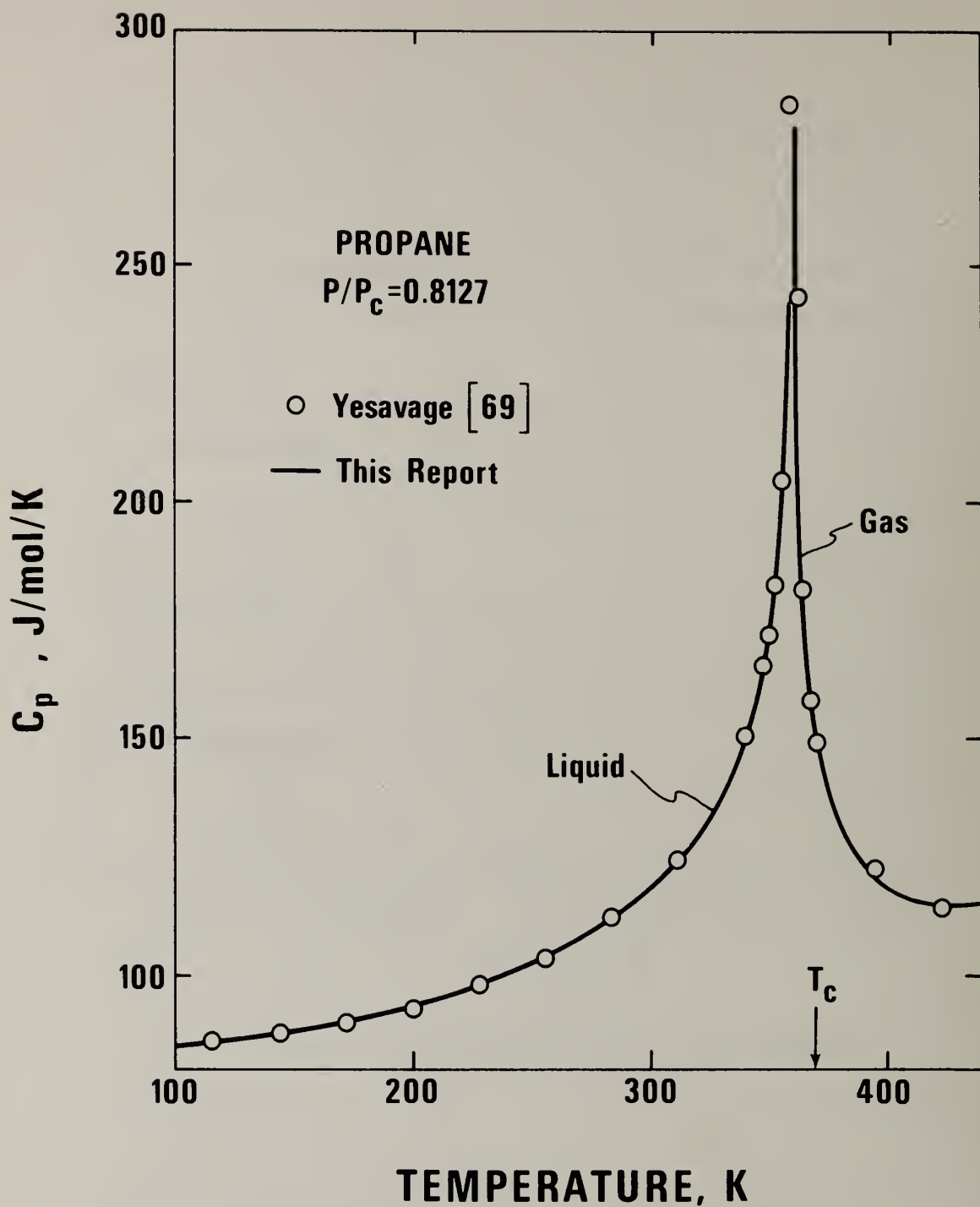


Figure 13. Comparison of  $C_p(T)$  at  $P/P_c = 0.813$ .

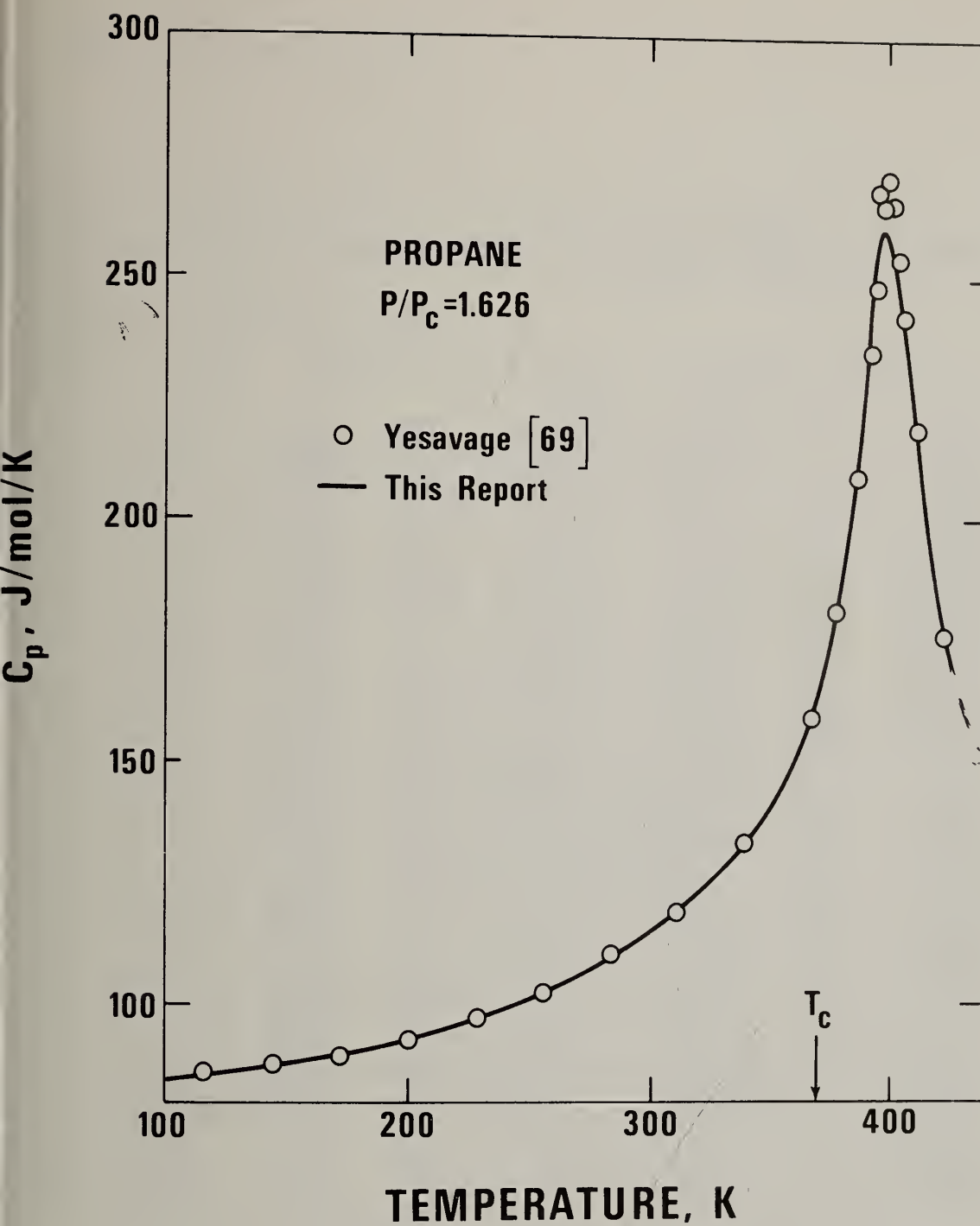


Figure 14. Comparison of  $C_p(T)$  at  $P/P_c = 1.626$ .

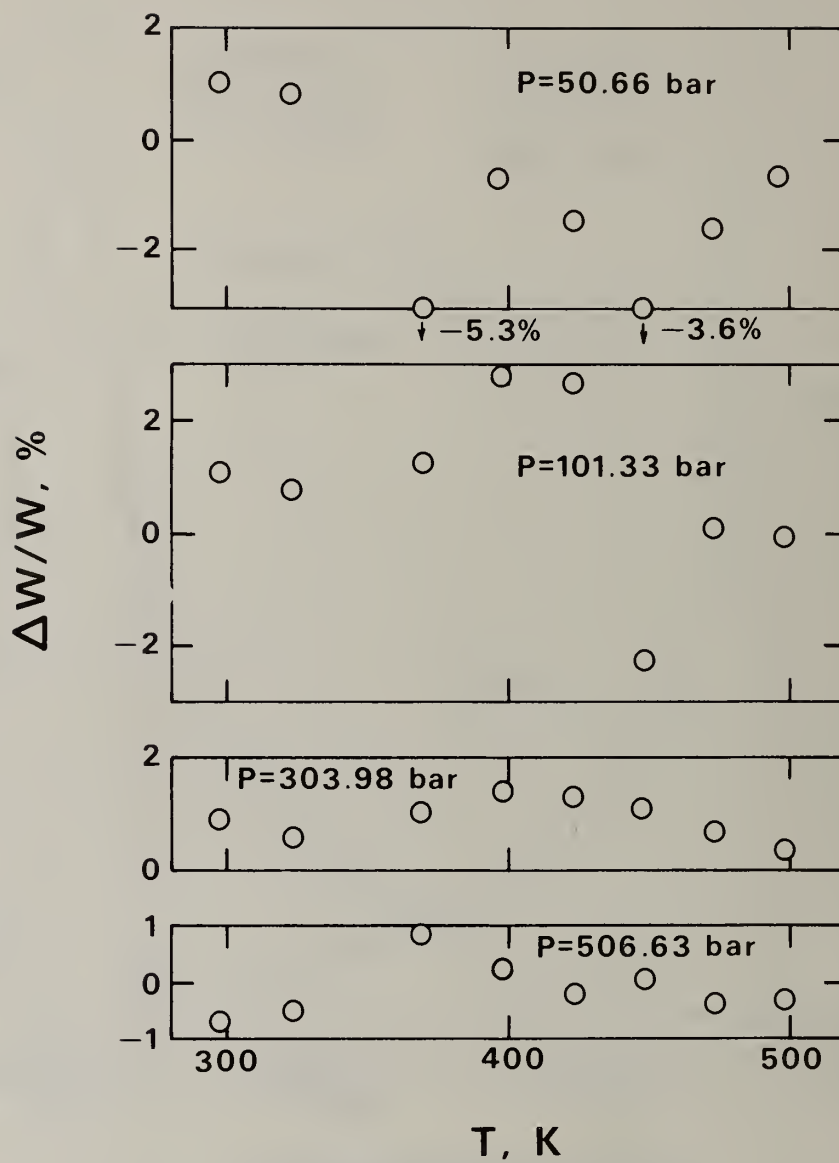


Figure 15. Deviations of Lacam speeds of sound.



Table 1. Vapor pressures of propane.

PROPANE VAPOR PRESSURES, EPP = 1.300

TICKNER, (2)CARRUTH, (3)MAAS, (4)DANA, (6)SAGE, (7)BEATTIE, (9)KEMP, (11)DESCHNER,  
(12)REAHNER, (13)CHERNEY, (14)CLEGG, (17)HELGESON, (19)GILLILAND, (20)BURREL, (25)DR A.

TP = 85.470, TCRT = 369.800

TP = .30000E-08, PCRT = 42.420437 BAR

WT	T, K	U	X	P, BAR	CALCD	PCNT	DPS/DT	RESID.
.010	94.540	.12478	.03190	.68500E-07	.65470E-07	4.63	.201E-07	.29643
.011	99.780	.18653	.05033	.30650E-06	.30112E-06	1.79	.831E-07	.24280
.012	105.150	.24342	.06922	.12190E-05	.12272E-05	-.66	.304E-06	.21568
.012	105.350	.24543	.06992	.13330E-05	.12895E-05	3.38	.319E-06	.24229
.012	108.250	.27370	.08012	.26660E-05	.25896E-05	2.95	.606E-06	.23382
.012	110.650	.29597	.08856	.43650E-05	.44835E-05	-2.64	.100E-05	.19907
.012	112.450	.31205	.09489	.66660E-05	.66618E-05	.06	.144E-05	.21189
.013	115.750	.34024	.10650	.13330E-04	.13324E-04	.04	.272E-05	.20794
.013	117.420	.35389	.11237	.17800E-04	.18636E-04	-4.49	.369E-05	.18540
.013	119.250	.36842	.11881	.26660E-04	.26620E-04	.15	.510E-05	.20437
.014	124.350	.40665	.13674	.66660E-04	.67892E-04	-1.81	.119E-04	.19104
.015	127.720	.43024	.14859	.11360E-03	.12077E-03	-5.93	.201E-04	.17252
.015	128.350	.43451	.15081	.13330E-03	.13402E-03	-.54	.220E-04	.19164
.015	132.850	.46385	.16664	.26660E-03	.27362E-03	-2.57	.418E-04	.18017
.016	134.150	.47196	.17121	.31250E-03	.33313E-03	-6.19	.499E-04	.16684
.016	139.150	.50173	.18879	.66660E-03	.68473E-03	-2.65	.949E-04	.17392
.017	143.740	.52724	.20494	.11960E-02	.12657E-02	-5.50	.164E-03	.16118
.017	144.350	.53051	.20708	.13330E-02	.13690E-02	-2.63	.175E-03	.16903
.019	149.950	.55927	.22678	.26660E-02	.27248E-02	-2.16	.321E-03	.16500
.020	155.720	.58674	.24707	.50660E-02	.52353E-02	-3.23	.568E-03	.15677
.020	158.150	.59771	.25562	.66660E-02	.67858E-02	-1.77	.712E-03	.15824
.021	162.450	.61631	.27074	.10390E-01	.10517E-01	-1.20	.104E-02	.15558
.022	164.750	.62587	.27883	.13330E-01	.13156E-01	1.32	.126E-02	.15935
.045	166.190	.63171	.28390	.15480E-01	.15084E-01	2.63	.142E-02	.16095
.049	173.320	.65923	.30897	.29330E-01	.28596E-01	2.57	.245E-02	.15399
.024	173.580	.66019	.30989	.29920E-01	.29238E-01	2.33	.249E-02	.15323
.026	178.650	.67837	.32772	.45700E-01	.44437E-01	2.84	.355E-02	.14965
.053	179.842	.68249	.33191	.49850E-01	.48844E-01	2.06	.385E-02	.14690
.058	187.347	.70725	.35831	.87250E-01	.85857E-01	1.62	.616E-02	.13937
.064	195.131	.73092	.38568	.14803E+00	.14630E+00	1.18	.956E-02	.13189
.070	202.910	.75276	.41304	.23987E+00	.23788E+00	.84	.142E-01	.12492
.077	209.926	.77107	.43772	.35774E+00	.35595E+00	.50	.197E-01	.11881
.082	214.982	.78352	.45550	.46884E+00	.46709E+00	.37	.244E-01	.11478
.088	220.259	.79591	.47406	.61212E+00	.61086E+00	.21	.302E-01	.11061
.094	225.098	.80676	.49108	.77179E+00	.77144E+00	.05	.363E-01	.10687
.098	228.806	.81476	.50412	.91484E+00	.91548E+00	-.07	.415E-01	.10409
.102	231.462	.82034	.51346	.10302E+01	.10309E+01	-.07	.455E-01	.10230
.710	258.150	.86999	.60732	.29197E+01	.29207E+01	-.03	.101E+00	.08608

Table 1. Continued.

PROPANE VAPOR PRESSURES, EPP = 1.300

ID	WT	T,K	U	X	P,BAR	CALCD	PCNT	DPS/DT	RE
25	.751	263.150	.87817	.62491	.34549E+01	.34586E+01	-.11	.115E+00	.0
25	.792	268.150	.88605	.64249	.40623E+01	.40676E+01	-.13	.129E+00	.0
25	.831	273.150	.89364	.66008	.47462E+01	.47533E+01	-.15	.145E+00	.0
17	.865	277.594	.90015	.67571	.54470E+01	.54318E+01	.28	.160E+00	.0
25	.869	278.150	.90095	.67766	.55124E+01	.55214E+01	-.16	.162E+00	.0
17	.902	283.150	.90801	.69525	.63980E+01	.63781E+01	.31	.181E+00	.0
25	.902	283.150	.90801	.69525	.63672E+01	.63781E+01	-.17	.181E+00	.0
25	.932	288.150	.91482	.71283	.73159E+01	.73292E+01	-.18	.200E+00	.0
17	.935	288.706	.91556	.71479	.74330E+01	.74411E+01	-.11	.202E+00	.0
25	.956	293.150	.92140	.73042	.83650E+01	.83811E+01	-.19	.221E+00	.0
6	.192	293.930	.92241	.73316	.86180E+01	.85547E+01	.74	.224E+00	.0
17	.961	294.261	.92283	.73433	.86180E+01	.86291E+01	-.13	.226E+00	.0
25	.974	298.150	.92776	.74800	.95262E+01	.95401E+01	-.21	.243E+00	.0
17	.979	299.817	.92983	.75387	.99350E+01	.99514E+01	-.16	.251E+00	.0
6	.196	301.090	.93140	.75834	.10352E+02	.10274E+02	.76	.257E+00	.0
11	.984	301.950	.93245	.76137	.10536E+02	.10497E+02	.38	.261E+00	.0
11	.986	302.950	.93367	.76489	.10807E+02	.10760E+02	.44	.265E+00	.0
25	.987	303.150	.93391	.76559	.10789E+02	.10813E+02	-.22	.266E+00	.0
11	.990	304.610	.93567	.77072	.11248E+02	.11207E+02	.37	.273E+00	.0
17	.991	305.372	.93658	.77340	.11397E+02	.11416E+02	-.17	.277E+00	.0
11	.993	306.680	.93813	.77800	.11829E+02	.11783E+02	.39	.284E+00	.0
6	.199	307.480	.93907	.78082	.12066E+02	.12012E+02	.45	.288E+00	.0
11	.995	308.350	.94009	.78388	.12317E+02	.12264E+02	.43	.292E+00	.0
17	.997	310.928	.94308	.79294	.13010E+02	.13034E+02	-.18	.305E+00	.0
11	.997	311.490	.94373	.79492	.13246E+02	.13206E+02	.30	.308E+00	.0
11	.997	311.490	.94373	.79492	.13249E+02	.13206E+02	.32	.308E+00	.0
25	.998	313.150	.94562	.80076	.13692E+02	.13725E+02	-.25	.317E+00	.0
6	.200	313.320	.94581	.80136	.13790E+02	.13779E+02	.08	.318E+00	.0
12	.998	313.483	.94600	.80193	.13790E+02	.13831E+02	-.30	.319E+00	.0
11	.999	315.480	.94824	.80895	.14500E+02	.14479E+02	.14	.330E+00	.0
17	.999	316.433	.94936	.81248	.14789E+02	.14813E+02	-.16	.335E+00	.0
11	1.000	319.150	.95120	.81834	.15471E+02	.15379E+02	.60	.345E+00	.0
11	1.000	318.280	.95134	.81880	.15474E+02	.15424E+02	.32	.345E+00	.0
6	.200	318.590	.95168	.81989	.15513E+02	.15532E+02	-.12	.347E+00	.05
17	1.000	322.039	.95542	.83202	.16734E+02	.16763E+02	-.17	.367E+00	.05
7	1.000	323.150	.95661	.83593	.17122E+02	.17174E+02	-.31	.374E+00	.05
14	1.000	323.150	.95661	.83593	.17154E+02	.17174E+02	-.12	.374E+00	.05
25	1.000	323.150	.95661	.83593	.17130E+02	.17174E+02	-.26	.374E+00	.05
6	.200	323.370	.95684	.83670	.17237E+02	.17257E+02	-.11	.375E+00	.05
11	1.000	324.940	.95850	.84223	.17798E+02	.17853E+02	-.31	.384E+00	.05
17	1.000	327.594	.96127	.85156	.18857E+02	.18894E+02	-.20	.401E+00	.05
6	.200	327.930	.96162	.85274	.18961E+02	.19029E+02	-.36	.403E+00	.05
11	1.000	330.600	.96436	.86213	.20098E+02	.20127E+02	-.14	.420E+00	.05
11	1.000	330.600	.96436	.86213	.20107E+02	.20127E+02	-.10	.420E+00	.05
12	1.000	332.039	.96581	.86719	.20684E+02	.20737E+02	-.26	.429E+00	.05
6	.200	332.190	.96587	.86737	.20684E+02	.20759E+02	-.36	.429E+00	.05
14	1.000	333.150	.96693	.87110	.21197E+02	.21218E+02	-.10	.436E+00	.05
17	1.000	333.150	.96693	.87110	.21188E+02	.21218E+02	-.14	.436E+00	.05
25	1.000	333.150	.96693	.87110	.21164E+02	.21218E+02	-.26	.436E+00	.05

Table 1. Continued.

PANNE VAPOR PRESSURES, EPP = 1.300

WT	T,K	U	X	P,BAR	CALCD	PCNT	DPS/DT	RESID.
1.000	333.960	.96774	.87395	.21596E+02	.21573E+02	.11	.441E+00	.05702
.200	336.090	.96985	.88144	.22408E+02	.22528E+02	-.53	.456E+00	.05160
1.000	336.650	.97040	.88341	.22749E+02	.22785E+02	-.16	.459E+00	.05439
1.000	338.706	.97240	.89064	.23718E+02	.23744E+02	-.11	.474E+00	.05425
1.000	339.594	.97326	.89376	.24132E+02	.24167E+02	-.14	.480E+00	.05371
.200	339.870	.97353	.89473	.24132E+02	.24300E+02	-.69	.482E+00	.04875
1.000	340.120	.97377	.89561	.24561E+02	.24420E+02	.58	.484E+00	.06005
1.000	340.120	.97377	.89561	.24539E+02	.24420E+02	.49	.484E+00	.05925
1.000	343.150	.97665	.90627	.25909E+02	.25918E+02	-.04	.505E+00	.05390
1.000	343.170	.97667	.90634	.25872E+02	.25928E+02	-.22	.505E+00	.05204
.200	343.480	.97697	.90743	.25855E+02	.26085E+02	-.88	.508E+00	.04497
1.000	344.261	.97770	.91018	.26462E+02	.26484E+02	-.08	.513E+00	.05315
1.000	344.640	.97805	.91151	.26778E+02	.26679E+02	.37	.516E+00	.05803
1.000	346.428	.97972	.91780	.27579E+02	.27614E+02	-.13	.530E+00	.05211
.200	346.930	.98018	.91957	.27579E+02	.27881E+02	-1.08	.534E+00	.04013
1.000	348.150	.98131	.92386	.28485E+02	.28538E+02	-.18	.543E+00	.05090
1.000	348.150	.98131	.92386	.28533E+02	.28538E+02	.02	.543E+00	.05312
1.000	348.150	.98131	.92386	.28486E+02	.28538E+02	-.18	.543E+00	.05094
1.000	348.240	.98139	.92417	.28709E+02	.28587E+02	.43	.544E+00	.05897
1.000	349.817	.98283	.92972	.29434E+02	.29454E+02	-.07	.556E+00	.05208
.200	350.090	.98308	.93068	.29303E+02	.29606E+02	-1.02	.558E+00	.03782
1.000	351.640	.98448	.93613	.30683E+02	.30481E+02	.66	.571E+00	.06356
1.000	352.706	.98543	.93988	.31026E+02	.31094E+02	-.22	.579E+00	.04875
.200	353.090	.98577	.94123	.31026E+02	.31317E+02	-.93	.583E+00	.03564
1.000	353.150	.98583	.94144	.31390E+02	.31352E+02	.12	.583E+00	.05473
1.000	353.150	.98583	.94144	.31308E+02	.31352E+02	-.14	.583E+00	.05000
1.000	355.372	.98780	.94926	.32654E+02	.32668E+02	-.04	.602E+00	.05122
.200	355.870	.98823	.95101	.32750E+02	.32969E+02	-.67	.606E+00	.03696
1.000	358.010	.99010	.95853	.34289E+02	.34288E+02	.00	.626E+00	.05193
1.000	358.150	.99022	.95903	.34400E+02	.34375E+02	.07	.627E+00	.05384
1.000	358.261	.99032	.95942	.34474E+02	.34445E+02	.08	.628E+00	.05421
.200	358.590	.99060	.96057	.34474E+02	.34652E+02	-.51	.631E+00	.03639
1.000	360.928	.99261	.96880	.36184E+02	.36153E+02	.08	.654E+00	.05482
1.000	361.120	.99277	.96947	.36292E+02	.36279E+02	.04	.656E+00	.05287
1.000	361.120	.99277	.96947	.36320E+02	.36279E+02	.11	.656E+00	.05605
.200	361.260	.99289	.96996	.36197E+02	.36371E+02	-.48	.657E+00	.03124
1.000	363.150	.99450	.97661	.37683E+02	.37631E+02	.14	.677E+00	.05915
1.000	363.200	.99454	.97679	.37687E+02	.37665E+02	.06	.677E+00	.05459
1.000	363.450	.99475	.97767	.37828E+02	.37835E+02	-.02	.680E+00	.05008
1.000	363.594	.99487	.97817	.37921E+02	.37933E+02	-.03	.682E+00	.04920
.200	363.760	.99501	.97876	.37921E+02	.38046E+02	-.33	.683E+00	.02962
1.000	365.470	.99644	.98477	.39048E+02	.39231E+02	-.47	.704E+00	.00401
.200	366.260	.99709	.98755	.39645E+02	.39791E+02	-.37	.714E+00	.00312
1.000	368.150	.99865	.99420	.41239E+02	.41165E+02	.18	.742E+00	.11271
1.000	368.372	.99883	.99498	.41369E+02	.41331E+02	.09	.746E+00	.08956
.200	368.760	.99915	.99634	.41369E+02	.41621E+02	-.61	.754E+00	-.33395
1.000	368.850	.99923	.99666	.41585E+02	.41689E+02	-.25	.756E+00	-.12760
1.000	368.970	.99932	.99708	.41813E+02	.41780E+02	.08	.758E+00	.11697

= 135, RMSPCT = .369



Table 1. Continued.

PROPANE VAPOR PRESSURES, EPP = 1.300

ID	WT	T,K	U	X	P,BAR	CALCD	PCNT	DPS/DT	RES
3	0.000	223.750	.81676	.50744	.11426E+01	.95530E+00	19.61	.429E-01	.14
3	0.000	230.250	.81781	.50920	.11599E+01	.97693E+00	18.73	.436E-01	.13
3	0.000	230.850	.81907	.51131	.11919E+01	.10034E+01	18.79	.446E-01	.13
3	0.000	234.750	.82707	.52502	.13999E+01	.11892E+01	17.72	.509E-01	.13
3	0.000	242.300	.84182	.55158	.19238E+01	.16234E+01	12.34	.646E-01	.12
3	0.000	250.050	.85604	.57883	.26944E+01	.21860E+01	23.26	.810E-01	.13
4	0.000	210.330	.77209	.43914	.36837E+00	.36397E+00	1.21	.200E-01	.11
4	0.000	216.410	.78694	.46052	.50689E+00	.50302E+00	.77	.259E-01	.11
4	0.000	216.470	.78708	.46073	.50822E+00	.50458E+00	.72	.260E-01	.11
4	0.000	221.640	.79906	.47892	.65835E+00	.65371E+00	.71	.319E-01	.11
4	0.000	227.250	.81144	.49865	.85753E+00	.85268E+00	.57	.392E-01	.10
4	0.000	231.080	.81955	.51212	.10181E+01	.10137E+01	.43	.449E-01	.10
4	0.000	235.040	.82765	.52604	.12050E+01	.12040E+01	.08	.513E-01	.10
4	0.000	235.090	.82775	.52622	.12082E+01	.12066E+01	.14	.514E-01	.10
4	0.000	242.730	.84263	.55309	.16520E+01	.16514E+01	.04	.654E-01	.09
4	0.000	249.070	.85429	.57539	.21041E+01	.21077E+01	-.17	.788E-01	.09
4	0.000	256.290	.86686	.60078	.27238E+01	.27378E+01	-.50	.960E-01	.08
4	0.000	267.230	.88470	.63943	.39303E+01	.39563E+01	-.66	.127E+00	.07
4	0.000	272.120	.89210	.65646	.45903E+01	.46055E+01	-.33	.142E+00	.07
4	0.000	275.630	.89730	.66880	.50529E+01	.51236E+01	-1.38	.154E+00	.07
4	0.000	282.670	.90734	.69356	.62542E+01	.62918E+01	-.60	.179E+00	.07
4	0.000	283.300	.90822	.69578	.63648E+01	.64052E+01	-.63	.181E+00	.07
4	0.000	291.090	.91871	.72314	.78607E+01	.79330E+01	-.91	.212E+00	.06
4	0.000	298.080	.92767	.74776	.94352E+01	.95231E+01	-.92	.243E+00	.06
4	0.000	307.090	.93862	.77945	.11644E+02	.11900E+02	-2.15	.286E+00	.05
4	0.000	315.210	.94794	.80800	.14232E+02	.14390E+02	-1.10	.328E+00	.05
4	0.000	323.490	.95697	.83713	.17023E+02	.17302E+02	-1.61	.376E+00	.05
4	0.000	323.490	.95697	.83713	.17065E+02	.17302E+02	-1.37	.376E+00	.05
13	0.000	303.150	.93391	.76559	.10801E+02	.10813E+02	-.11	.266E+00	.06
13	0.000	323.150	.95661	.83593	.17154E+02	.17174E+02	-.12	.374E+00	.05
19	0.000	314.317	.94750	.80662	.14065E+02	.14262E+02	-1.38	.326E+00	.05
19	0.000	330.372	.96412	.86133	.20271E+02	.20031E+02	1.20	.418E+00	.06
19	0.000	345.372	.97874	.91409	.27441E+02	.27059E+02	1.41	.522E+00	.06
19	0.000	357.594	.98974	.95707	.34060E+02	.34028E+02	.09	.622E+00	.05
20	0.000	148.950	.55429	.22326	.40000E-02	.24196E-02	65.32	.290E-03	.30
20	0.000	154.350	.58273	.24401	.80000E-02	.47605E-02	68.05	.523E-03	.29
20	0.000	163.950	.62258	.27602	.20000E-01	.12180E-01	64.20	.118E-02	.27
20	0.000	172.650	.65674	.30662	.40000E-01	.26995E-01	48.17	.233E-02	.23
20	0.000	179.850	.68252	.33194	.66660E-01	.48874E-01	36.39	.385E-02	.21
20	0.000	190.350	.71661	.36887	.13332E+00	.10609E+00	25.68	.734E-02	.18
20	0.000	196.650	.73590	.39173	.19998E+00	.16352E+00	22.30	.105E-01	.17
20	0.000	202.050	.75043	.41002	.26664E+00	.22591E+00	18.03	.136E-01	.15
20	0.000	210.250	.77189	.43886	.39997E+00	.36237E+00	10.38	.199E-01	.13
20	0.000	215.450	.78465	.45714	.53329E+00	.47363E+00	11.42	.249E-01	.13
20	0.000	219.950	.79520	.47297	.66661E+00	.60158E+00	10.81	.298E-01	.13
20	0.000	223.750	.80379	.48634	.79993E+00	.72372E+00	10.53	.345E-01	.12
20	0.000	225.550	.80775	.49267	.86660E+00	.78798E+00	9.98	.369E-01	.12
20	0.000	227.050	.81101	.49794	.93326E+00	.84436E+00	10.46	.390E-01	.12
20	0.000	228.050	.81315	.50146	.97325E+00	.88454E+00	10.03	.404E-01	.12
20	0.000	229.050	.81528	.50498	.10133E+01	.92565E+00	9.46	.418E-01	.12

Table 2. Densities of the saturated liquid.

PROPANE SATURATED LIQUID DENSITIES, EL = .350

(1)MAAS, (2)VANDERVET, (3)NGASAA, (4)SAGE, (6)REAMER, (7)CLEGG,  
(8)FRANCIS, (11)SEEMANN, (12)HELGESON, (13)KLOSEK, (14)SHANAA, (15)JENSEN,  
(16)SLIWINSKI, (17)TOMLINSON, (18)KAHRE, (19)RODOSEVICH, (20)HAYNES, (21)DESCHNER,  
(22)ORRIT, (23)MCCLUNE, (25)DOUSLIN.

TTRP = 85.470, TCRT = 369.800, DTRP = 16.620, DCRT = 4.960

.775396679    -.167912979    .081166807

ID	WT	T,K	X	MOL/L	CALCD	PCNT	DDS/DT	RESID.
22	1.000	86.650	.99585	16.607	16.593	.08	-.02266	1.12279
22	1.000	90.100	.98372	16.522	16.515	.04	-.02268	.74573
19	1.000	91.010	.98052	16.485	16.494	-.06	-.02268	.62847
23	1.000	93.150	.97299	16.442	16.446	-.02	-.02269	.67268
22	1.000	96.040	.96282	16.385	16.380	.03	-.02271	.70803
23	1.000	98.150	.95540	16.331	16.332	-.01	-.02272	.69012
19	1.000	100.010	.94886	16.291	16.290	.01	-.02273	.69704
20	1.000	100.075	.94863	16.307	16.289	.11	-.02273	.74003
22	1.000	100.980	.94545	16.272	16.268	.02	-.02274	.70316
23	1.000	103.150	.93782	16.217	16.219	-.01	-.02275	.69047
20	1.000	105.075	.93105	16.187	16.175	.08	-.02276	.71929
22	1.000	106.170	.92720	16.152	16.150	.01	-.02277	.69921
14	1.000	108.150	.92023	16.096	16.105	-.06	-.02278	.68132
19	1.000	108.150	.92023	16.105	16.105	-.00	-.02278	.69609
23	1.000	108.150	.92023	16.101	16.105	-.03	-.02278	.68938
20	1.000	110.075	.91346	16.072	16.061	.07	-.02280	.71397
22	1.000	111.520	.90838	16.028	16.028	.00	-.02281	.69769
23	1.000	113.150	.90265	15.985	15.991	-.04	-.02282	.69012
19	1.000	115.000	.89614	15.946	15.949	-.01	-.02283	.69614
20	1.000	115.075	.89588	15.956	15.947	.06	-.02283	.71040
22	1.000	116.860	.88960	15.906	15.906	.00	-.02285	.70002
23	1.000	118.150	.88506	15.870	15.877	-.04	-.02286	.69225
20	1.000	120.075	.87829	15.841	15.833	.05	-.02287	.71028
22	1.000	122.270	.87057	15.782	15.782	.00	-.02289	.70171
23	1.000	123.150	.86748	15.755	15.762	-.05	-.02290	.69413
20	1.000	125.075	.86071	15.725	15.718	.04	-.02292	.70943
22	1.000	127.660	.85162	15.660	15.659	.01	-.02294	.70451
23	1.000	128.150	.84989	15.639	15.648	-.06	-.02295	.69577
20	1.000	130.075	.84312	15.609	15.603	.03	-.02297	.70907
22	1.000	133.130	.83238	15.531	15.533	-.01	-.02300	.70438
23	1.000	133.150	.83231	15.524	15.533	-.06	-.02300	.69866
20	1.000	135.075	.82554	15.491	15.488	.02	-.02302	.70860
23	1.000	138.150	.81472	15.411	15.418	-.04	-.02306	.70322
22	1.000	138.430	.81374	15.408	15.411	-.02	-.02306	.70560
20	1.000	140.075	.80795	15.375	15.373	.01	-.02308	.70993
23	1.000	143.150	.79714	15.296	15.302	-.04	-.02312	.70547
22	1.000	143.890	.79453	15.282	15.285	-.02	-.02313	.70770
20	1.000	145.075	.79037	15.259	15.258	.01	-.02315	.71132
23	1.000	148.150	.77955	15.182	15.186	-.03	-.02319	.70872
22	1.000	149.610	.77442	15.148	15.153	-.03	-.02321	.70985
20	1.000	150.075	.77278	15.140	15.142	-.01	-.02322	.71151
23	1.000	153.150	.76197	15.067	15.070	-.02	-.02327	.71202
22	1.000	155.080	.75518	15.025	15.025	-.00	-.02330	.71429
23	1.000	158.150	.74438	14.951	14.954	-.02	-.02336	.71424
22	1.000	160.540	.73598	14.898	14.898	.00	-.02340	.71710
23	1.000	163.150	.72680	14.834	14.837	-.02	-.02346	.71664
22	1.000	165.940	.71698	14.772	14.771	.00	-.02351	.71936
23	1.000	168.150	.70921	14.718	14.719	-.01	-.02356	.71929
22	1.000	171.410	.69775	14.659	14.642	.11	-.02364	.72882
23	1.000	173.150	.69163	14.595	14.601	-.04	-.02368	.71907

Table 2. Continued.

## PROPANE SATURATED LIQUID DENSITIES, EL = .350

ID	WT	T,K	X	MOL/L	CALCO	PCNT	DOS/DT	RESID.
22	1.000	182.340	.65930	14.385	14.382	.02	-.02393	.72672
22	1.000	187.800	.64010	14.254	14.251	.02	-.02410	.72890
22	1.000	193.300	.62076	14.120	14.118	.02	-.02429	.73100
22	1.000	198.890	.60110	13.986	13.982	.03	-.02451	.73375
20	1.000	200.000	.59719	13.956	13.954	.01	-.02455	.73336
22	1.000	204.540	.58123	13.847	13.843	.03	-.02475	.73620
22	1.000	210.020	.56195	13.710	13.706	.03	-.02500	.73818
22	1.000	216.020	.54085	13.559	13.555	.03	-.02531	.74035
22	1.000	222.040	.51968	13.405	13.402	.02	-.02566	.74238
22	1.000	227.360	.50097	13.268	13.264	.02	-.02600	.74437
22	1.000	232.910	.48145	13.120	13.119	.01	-.02638	.74581
22	1.000	235.610	.47195	13.051	13.048	.02	-.02658	.74735
22	1.000	238.400	.46214	12.975	12.973	.01	-.02680	.74792
20	1.000	240.000	.45651	12.927	12.930	-.02	-.02693	.74724
22	1.000	241.180	.45236	12.903	12.898	.04	-.02703	.74982
22	1.000	243.980	.44251	12.829	12.822	.05	-.02727	.75125
25	1.000	258.150	.39268	12.415	12.426	-.09	-.02868	.75144
25	1.000	263.150	.37509	12.270	12.282	-.09	-.02927	.75310
25	1.000	268.150	.35751	12.126	12.134	-.06	-.02992	.75574
20	1.000	270.000	.35100	12.073	12.078	-.04	-.03017	.75705
25	1.000	273.150	.33992	11.983	11.982	.01	-.03063	.75937
25	1.000	278.150	.32234	11.829	11.827	.02	-.03141	.76112
20	1.000	280.000	.31583	11.762	11.769	-.06	-.03172	.75961
25	1.000	283.150	.30475	11.671	11.668	.03	-.03228	.76283
16	1.000	283.200	.30458	11.663	11.666	-.03	-.03228	.76128
25	1.000	288.150	.28717	11.507	11.504	.02	-.03323	.76413
20	1.000	288.706	.28521	11.479	11.486	-.06	-.03335	.76201
25	1.000	293.150	.26958	11.338	11.335	.02	-.03430	.76539
16	1.000	293.190	.26944	11.336	11.334	.02	-.03431	.76532
25	1.000	298.150	.25200	11.165	11.161	.04	-.03549	.76696
16	1.000	303.150	.23441	10.983	10.980	.02	-.03683	.76775
25	1.000	303.150	.23441	10.981	10.980	.01	-.03683	.76738
16	1.000	313.120	.19935	10.600	10.598	.03	-.04009	.76999
25	1.000	313.150	.19924	10.586	10.596	-.10	-.04010	.76697
16	1.000	323.120	.16418	10.176	10.176	.00	-.04447	.77124
25	1.000	323.150	.16407	10.169	10.175	-.05	-.04449	.76994
16	1.000	333.110	.12904	9.714	9.702	.12	-.05072	.77554
25	1.000	333.150	.12890	9.697	9.700	-.03	-.05075	.77197
16	1.000	343.080	.09398	9.157	9.152	.05	-.06052	.77511
25	1.000	343.170	.09366	9.142	9.147	-.05	-.06064	.77283
16	1.000	348.080	.07639	8.838	8.832	.07	-.06807	.77615
25	1.000	348.150	.07614	8.825	8.827	-.02	-.06820	.77397
16	1.000	353.090	.05877	8.469	8.465	.05	-.07917	.77593
25	1.000	353.150	.05856	8.459	8.460	-.01	-.07934	.77455
16	1.000	358.100	.04115	8.022	8.027	-.06	-.09757	.77377
16	1.000	363.110	.02353	7.459	7.455	.05	-.13645	.77648
16	1.000	368.100	.00598	6.488	6.482	.09	-.31941	.77835
16	1.000	369.100	.00246	6.080	6.071	.14	-.56146	.78170
16	1.000	369.600	.00070	5.669	5.674	-.09	-1.25597	.76992

NP = 99, RMSPCT = .046



Table 3. Densities of the saturated vapor.

PROPANE SATURATED VAPOR DENSITIES, EG = .350

(1) VIRIAL/V.P.EQNS., (4) SAGE, (6) REAMER, (7) CLEGG, (12) HELGESON, (16) SLIWINSKI,  
(21) DESCHNER, (25) DOUSLIN.

TTRP = 85.470, TCRT = 369.800, DGAT = .4221626E-09, DCRT = 4.960

	.072453281	.170534468	-.278060163	.438982342	-.841080253	.405105441			
ID	WT	T,K	U	X	MOL/L	CALCD	PCT	DOS/DT	RESID.
1	.122	90.000	.93454	.98407	.20201E-08	.20282E-08	-.40	.667E-09	-.01309
1	.135	100.000	.81102	.94890	.38478E-07	.38734E-07	-.66	.102E-07	-.01332
1	.149	110.000	.70997	.91373	.42353E-06	.42565E-06	-.50	.924E-07	-.00987
1	.162	120.000	.62575	.87856	.30778E-05	.30846E-05	-.22	.557E-06	-.00409
1	.176	130.000	.55449	.84339	.16207E-04	.16202E-04	.03	.247E-05	.00312
1	.189	140.000	.49342	.80822	.66138E-04	.66010E-04	.20	.855E-05	.01112
1	.203	150.000	.44048	.77305	.21987E-03	.21929E-03	.26	.244E-04	.01946
1	.216	160.000	.39416	.73788	.61850E-03	.61699E-03	.25	.593E-04	.02782
1	.230	170.000	.35330	.70270	.15165E-02	.15139E-02	.17	.127E-03	.03595
1	.243	180.000	.31697	.66753	.33180E-02	.33154E-02	.08	.243E-03	.04368
1	.257	190.000	.28446	.63236	.66013E-02	.66024E-02	-.02	.427E-03	.05089
1	.270	200.000	.25521	.59719	.12128E-01	.12139E-01	-.09	.696E-03	.05748
1	.284	210.000	.22874	.56202	.20840E-01	.20868E-01	-.14	.107E-02	.06342
1	.297	220.000	.20468	.52685	.33846E-01	.33896E-01	-.15	.156E-02	.06868
1	.311	230.000	.18271	.49168	.52415E-01	.52486E-01	-.14	.218E-02	.07325
1	.324	240.000	.16258	.45651	.77981E-01	.78066E-01	-.11	.296E-02	.07716
1	.338	250.000	.14405	.42134	.11217E+00	.11225E+00	-.08	.391E-02	.08041
1	.352	260.000	.12695	.38617	.15683E+00	.15691E+00	-.05	.506E-02	.08305
1	.365	270.000	.11111	.35100	.21419E+00	.21422E+00	-.01	.645E-02	.08508
1	.379	280.000	.09641	.31583	.28696E+00	.28686E+00	.04	.813E-02	.08653
16	1.000	283.200	.09192	.30458	.31408E+00	.31385E+00	.07	.874E-02	.08687
16	1.000	293.190	.07855	.26944	.41159E+00	.41176E+00	-.04	.109E-01	.08784
16	1.000	303.150	.06609	.23441	.53473E+00	.53363E+00	.21	.136E-01	.08798
16	1.000	313.120	.05441	.19935	.68553E+00	.68600E+00	-.07	.171E-01	.08830
16	1.000	323.120	.04343	.16418	.87987E+00	.87828E+00	.18	.216E-01	.08770
25	1.000	323.150	.04339	.16407	.87580E+00	.87893E+00	-.36	.216E-01	.08829
16	1.000	333.110	.03311	.12904	.11252E+01	.11239E+01	.12	.280E-01	.08712
25	1.000	333.150	.03307	.12890	.11219E+01	.11251E+01	-.28	.280E-01	.08756
16	1.000	343.080	.02341	.09398	.14527E+01	.14480E+01	.32	.379E-01	.08582
25	1.000	343.170	.02333	.09366	.14489E+01	.14514E+01	-.17	.380E-01	.08639
16	1.000	348.080	.01876	.07639	.16563E+01	.16554E+01	.05	.455E-01	.08539
25	1.000	348.150	.01869	.07614	.16565E+01	.16586E+01	-.13	.457E-01	.08561
16	1.000	353.090	.01423	.05877	.19140E+01	.19097E+01	.22	.568E-01	.08420
25	1.000	353.150	.01417	.05856	.19107E+01	.19131E+01	-.13	.570E-01	.08464
16	1.000	358.100	.00982	.04115	.22450E+01	.22364E+01	.38	.754E-01	.08259
16	1.000	363.110	.00554	.02353	.26947E+01	.26974E+01	-.10	.114E+00	.08121
16	1.000	365.600	.00345	.01477	.30215E+01	.30303E+01	-.29	.158E+00	.08000
16	1.000	368.100	.00139	.00598	.35367E+01	.35505E+01	-.39	.289E+00	.07791
16	1.000	369.100	.00057	.00246	.39266E+01	.39248E+01	.04	.513E+00	.07506
16	1.000	369.600	.00016	.00070	.43177E+01	.42883E+01	.69	.116E+01	.07023

NP = 40, RMSPCT = .252

## PROPANE SATURATED VAPOR DENSITIES, EG = .350

ID	WT	T,K	U	X	MOL/L	CALCD	PCT	DDS/DT	RESID.
4	0.000	293.928	.07759	.26684	.43306E+00	.41990E+00	3.14	.111E-01	.08439
4	0.000	301.094	.06859	.24164	.52372E+00	.50622E+00	3.46	.130E-01	.08439
4	0.000	307.483	.06092	.21917	.61340E+00	.59568E+00	2.98	.150E-01	.08503
4	0.000	313.317	.05419	.19865	.70507E+00	.68937E+00	2.28	.171E-01	.08575
4	0.000	318.594	.04831	.18009	.80100E+00	.78563E+00	1.96	.194E-01	.08596
4	0.000	323.371	.04316	.16329	.89692E+00	.88372E+00	1.49	.217E-01	.08625
4	0.000	327.928	.03838	.14727	.99576E+00	.98864E+00	.72	.244E-01	.08683
4	0.000	332.094	.03413	.13261	.11082E+01	.10959E+01	1.12	.272E-01	.08607
4	0.000	336.094	.03015	.11855	.12218E+01	.12110E+01	.89	.304E-01	.08597
4	0.000	339.872	.02647	.10526	.13434E+01	.13327E+01	.80	.341E-01	.08566
4	0.000	343.483	.02303	.09256	.14766E+01	.14634E+01	.90	.384E-01	.08508
4	0.000	346.928	.01982	.08044	.16202E+01	.16042E+01	1.00	.435E-01	.08444
4	0.000	350.094	.01692	.06931	.17815E+01	.17510E+01	1.74	.495E-01	.08294
4	0.000	353.094	.01422	.05876	.19572E+01	.19099E+01	2.47	.568E-01	.08131
4	0.000	355.872	.01176	.04899	.21469E+01	.20796E+01	3.24	.658E-01	.07948
4	0.000	358.594	.00939	.03941	.23512E+01	.22743E+01	3.38	.780E-01	.07820
4	0.000	361.261	.00711	.03003	.25910E+01	.25043E+01	3.46	.957E-01	.07670
4	0.000	363.761	.00499	.02124	.28357E+01	.27746E+01	2.20	.123E+00	.07698
4	0.000	366.261	.00290	.01245	.30889E+01	.31411E+01	-1.66	.178E+00	.08226
4	0.000	368.761	.00085	.00365	.34895E+01	.37726E+01	-7.50	.397E+00	.09905
6	0.000	313.480	.05401	.19808	.69556E+00	.69218E+00	.49	.172E-01	.08768
6	0.000	324.480	.04198	.15939	.88590E+00	.90817E+00	-2.45	.223E-01	.09058
6	0.000	332.040	.03418	.13280	.10997E+01	.10944E+01	.48	.272E-01	.08679
6	0.000	339.590	.02674	.10625	.13511E+01	.13231E+01	2.11	.338E-01	.08420
6	0.000	346.430	.02028	.08219	.15827E+01	.15827E+01	-.00	.427E-01	.08572
6	0.000	352.710	.01457	.06011	.18713E+01	.18883E+01	-.90	.557E-01	.08574
6	0.000	358.260	.00968	.04059	.22167E+01	.22486E+01	-1.42	.763E-01	.08511
6	0.000	363.590	.00513	.02184	.26643E+01	.27538E+01	-3.25	.121E+00	.08636
6	0.000	368.370	.00117	.00503	.34203E+01	.36329E+01	-5.85	.323E+00	.09265
7	0.000	323.150	.04339	.16407	.85900E+00	.87893E+00	-2.27	.216E-01	.09043
7	0.000	333.150	.03307	.12890	.11250E+01	.11251E+01	-.00	.280E-01	.08725
7	0.000	343.150	.02335	.09373	.14600E+01	.14507E+01	.64	.380E-01	.08543
7	0.000	348.150	.01869	.07614	.16700E+01	.16586E+01	.68	.457E-01	.08461
7	0.000	353.150	.01417	.05856	.19200E+01	.19131E+01	.36	.570E-01	.08401
7	0.000	358.150	.00978	.04097	.22400E+01	.22402E+01	-.01	.757E-01	.08313
7	0.000	363.150	.00550	.02339	.27000E+01	.27020E+01	-.07	.115E+00	.08115
7	0.000	368.150	.00135	.00580	.35200E+01	.35651E+01	-1.27	.295E+00	.08010
12	0.000	277.594	.09985	.32429	.26657E+00	.26782E+00	-.47	.770E-02	.08680
12	0.000	283.150	.09199	.30475	.31213E+00	.31341E+00	-.41	.873E-02	.08741
12	0.000	288.706	.08444	.28521	.36387E+00	.36510E+00	-.34	.989E-02	.08786
12	0.000	294.261	.07717	.26567	.42258E+00	.42361E+00	-.24	.112E-01	.08813
12	0.000	299.817	.07017	.24613	.48903E+00	.48981E+00	-.16	.127E-01	.08829
12	0.000	305.372	.06342	.22660	.56432E+00	.56470E+00	-.07	.143E-01	.08831
12	0.000	310.928	.05692	.20706	.64959E+00	.64950E+00	.01	.162E-01	.08824
12	0.000	316.483	.05064	.18752	.74621E+00	.74570E+00	.07	.185E-01	.08808
12	0.000	322.039	.04458	.16798	.85592E+00	.85523E+00	.08	.210E-01	.08786
12	0.000	327.594	.03873	.14844	.98123E+00	.98053E+00	.07	.242E-01	.08757
12	0.000	333.150	.03307	.12890	.11246E+01	.11251E+01	-.04	.280E-01	.08729
12	0.000	338.706	.02760	.10936	.12909E+01	.12936E+01	-.21	.329E-01	.08696
12	0.000	344.261	.02230	.08982	.14851E+01	.14937E+01	-.57	.395E-01	.08673
12	0.000	349.817	.01717	.07028	.17175E+01	.17374E+01	-1.14	.489E-01	.08659
12	0.000	355.372	.01220	.05074	.20058E+01	.20472E+01	-2.02	.640E-01	.08668
12	0.000	360.928	.00739	.03120	.23993E+01	.24729E+01	-2.97	.931E-01	.08669
21	0.000	303.150	.06609	.23441	.45354E+00	.53363E+00	-15.01	.136E-01	.10616
21	0.000	318.150	.06014	.21683	.56013E+00	.60577E+00	-7.53	.153E-01	.09688
21	0.000	313.150	.05438	.19924	.65764E+00	.68652E+00	-4.21	.171E-01	.09294
21	0.000	318.150	.04880	.18166	.77102E+00	.77706E+00	-.78	.192E-01	.08896
21	0.000	323.150	.04339	.16407	.89575E+00	.87893E+00	1.91	.216E-01	.08581
21	0.000	328.150	.03815	.14648	.10386E+01	.99406E+00	4.48	.245E-01	.08273
21	0.000	333.150	.03307	.12890	.11792E+01	.11251E+01	4.81	.280E-01	.08194
21	0.000	338.150	.02814	.11131	.13153E+01	.12755E+01	3.12	.323E-01	.08324
21	0.000	343.150	.02335	.09373	.14853E+01	.14507E+01	2.39	.380E-01	.08340
21	0.000	348.150	.01869	.07614	.16441E+01	.16586E+01	-.88	.457E-01	.08653
21	0.000	353.150	.01417	.05856	.18867E+01	.19131E+01	-1.38	.570E-01	.08628
21	0.000	358.150	.00978	.04097	.22243E+01	.22402E+01	-.79	.757E-01	.08425
21	0.000	363.150	.00550	.02339	.26759E+01	.27020E+01	-.97	.115E+00	.08263
21	0.000	368.150	.00135	.00580	.35830E+01	.35651E+01	.50	.295E+00	.07558

Table 4. Second virial coefficients of propane.

PROPANE SECOND VIRIAL COEFF., M = 3, E = 0.0

(1)MCGLASHAN, (2)KAPALLO, (3)DYMOND/SMITH, (4)STREIN, (5)HAHN,  
(7)GUNN, (8)BREWER, (9)BEATTIE, (10)BOTTOMLEY, (11)CHERNEY,  
(12)DESCHNER, (13)JESSEN, (14)KRETSCHNER, (15)REAMER, (16)SAGE

TCRT = 369.80, DCRT = .00496 MOL/CC

	.4540611	-1.1899134		-4.726952			
IO	WT	T,K	X	B*	CALC	DIF	PCT
5	.458	211.300	.5714	-4.1862	-4.1623	-.0239	-.58
5	.552	231.200	.6252	-3.3728	-3.3835	.0107	.32
2	.597	244.000	.6598	-3.0256	-2.9949	-.0307	-1.03
8	.610	248.150	.6710	-2.8718	-2.8835	.0117	.41
5	.620	251.500	.6801	-2.8123	-2.7982	-.0141	-.50
3	.643	260.000	.7031	-2.6090	-2.5984	-.0105	-.41
3	.667	270.000	.7301	-2.3709	-2.3902	.0193	.81
2	.673	273.000	.7382	-2.3659	-2.3327	-.0333	-1.43
8	.673	273.150	.7386	-2.3213	-2.3298	.0086	.37
13	.673	273.160	.7387	-2.3312	-2.3296	-.0016	-.07
5	.675	273.800	.7404	-2.3362	-2.3177	-.0185	-.80
3	.697	285.000	.7707	-2.1030	-2.1225	.0195	.92
16	0.000	294.270	.7958	-2.0711	-1.9794	-.0917	-4.63
10	.715	295.210	.7983	-2.0232	-1.9657	-.0575	-2.93
1	.715	295.400	.7988	-1.9790	-1.9629	-.0161	-.82
4	.716	296.100	.8007	-1.9642	-1.9528	-.0113	-.58
2	.717	297.000	.8031	-1.9542	-1.9400	-.0143	-.74
8	.719	298.150	.8062	-1.9245	-1.9237	-.0007	-.04
3	.722	300.000	.8112	-1.8848	-1.8981	.0133	.70
12	0.000	303.160	.8198	-1.8949	-1.8554	-.0395	-2.13
12	0.000	303.160	.8198	-1.9046	-1.8554	-.0493	-2.66
14	0.000	303.160	.8198	-1.9592	-1.8554	-.1038	-5.60
1	.732	306.500	.8288	-1.8302	-1.8118	-.0184	-1.02
4	.734	308.000	.8329	-1.7881	-1.7928	.0047	.26
7	.738	310.900	.8407	-1.6656	-1.7567	.0912	5.19
15	.738	310.940	.8408	-1.6640	-1.7563	.0922	5.25
15	.738	310.940	.8408	-1.6368	-1.7563	.1195	6.80
16	0.000	310.940	.8408	-1.8937	-1.7563	-.1375	-7.83
3	.744	315.000	.8518	-1.6914	-1.7077	.0163	.95
1	.747	317.600	.8588	-1.6814	-1.6776	-.0038	-.23
2	.751	321.000	.8680	-1.6864	-1.6395	-.0469	-2.86
11	.754	323.160	.8739	-1.6349	-1.6159	-.0190	-1.18
13	.754	323.160	.8739	-1.6120	-1.6159	.0039	.24
1	.759	327.600	.8859	-1.6070	-1.5690	-.0380	-2.42
15	.759	327.600	.8859	-1.5150	-1.5690	.0541	3.45
15	.759	327.600	.8859	-1.5178	-1.5690	.0513	3.27
16	0.000	327.600	.8859	-1.7531	-1.5690	-.1841	-11.73
3	.762	330.000	.8924	-1.5376	-1.5445	.0069	.45
4	.765	332.900	.9002	-1.5326	-1.5157	-.0169	-1.12
1	.770	337.800	.9135	-1.4830	-1.4687	-.0143	-.97
15	.777	344.270	.9310	-1.3895	-1.4099	.0204	1.45
15	.777	344.270	.9310	-1.3918	-1.4099	.0182	1.29
16	0.000	344.270	.9310	-1.5709	-1.4099	-.1609	-11.41
7	.777	344.300	.9310	-1.3908	-1.4097	.0189	1.34
1	.781	347.900	.9408	-1.3590	-1.3785	.0194	1.41
12	0.000	348.160	.9415	-1.4341	-1.3762	-.0578	-4.20
12	0.000	348.160	.9415	-1.4533	-1.3762	-.0770	-5.60
3	.783	350.000	.9465	-1.3640	-1.3607	-.0033	-.24



Table 4. Continued.

## PROPANE SECOND VIRIAL COEFF., M = 3, E = 0.0

ID	WT	T,K	X	B*	CALC	DIF	PCT
4	.786	353.800	.9567	-1.3452	-1.3294	-.0157	-1.18
1	.790	357.900	.9678	-1.3144	-1.2968	-.0176	-1.35
15	.793	360.940	.9760	-1.2701	-1.2734	.0034	.26
15	.793	360.940	.9760	-1.2737	-1.2734	-.0003	-.02
16	0.000	360.940	.9760	-1.4074	-1.2734	-.1339	-10.52
1	.799	368.200	.9957	-1.2102	-1.2199	.0097	.79
9	.800	369.970	1.0005	-1.2181	-1.2073	-.0107	-.89
9	.800	369.970	1.0005	-1.2896	-1.2073	-.0823	-6.81
9	.803	373.160	1.0091	-1.1994	-1.1852	-.0142	-1.20
9	.803	373.160	1.0091	-1.2251	-1.1852	-.0399	-3.37
11	.803	373.160	1.0091	-1.1911	-1.1852	-.0060	-.50
12	0.000	373.160	1.0091	-1.2201	-1.1852	-.0349	-2.94
12	0.000	373.160	1.0091	-1.2698	-1.1852	-.0846	-7.14
4	.803	373.400	1.0097	-1.2008	-1.1835	-.0173	-1.46
3	.804	375.000	1.0141	-1.1755	-1.1727	-.0029	-.24
7	.806	377.600	1.0211	-1.1701	-1.1553	-.0148	-1.28
15	.806	377.600	1.0211	-1.1654	-1.1553	-.0101	-.87
15	.806	377.600	1.0211	-1.1636	-1.1553	-.0083	-.72
16	0.000	377.600	1.0211	-1.2634	-1.1553	-.1081	-9.36
1	.806	377.700	1.0214	-1.1358	-1.1546	.0188	1.63
12	0.000	380.960	1.0302	-1.1169	-1.1334	.0165	1.45
1	.814	388.500	1.0506	-1.0565	-1.0862	.0298	2.74
4	.818	394.000	1.0654	-1.0600	-1.0536	-.0064	-.60
9	.820	398.160	1.0767	-1.0330	-1.0298	-.0032	-.31
9	.820	398.160	1.0767	-1.0466	-1.0298	-.0168	-1.63
11	.820	398.160	1.0767	-1.0278	-1.0298	.0020	.20
12	0.000	398.160	1.0767	-1.0406	-1.0298	-.0107	-1.04
12	0.000	398.160	1.0767	-1.1110	-1.0298	-.0812	-7.89
3	.822	400.000	1.0817	-1.0218	-1.0195	-.0022	-.22
1	.822	400.100	1.0819	-.9970	-1.0190	.0220	2.16
15	.828	410.940	1.1112	-.9874	-.9612	-.0262	-2.73
15	.828	410.940	1.1112	-.9900	-.9612	-.0288	-3.00
4	.830	413.800	1.1190	-.9479	-.9467	-.0012	-.12
9	.835	423.160	1.1443	-.9001	-.9013	.0011	.13
9	.835	423.160	1.1443	-.9077	-.9013	-.0064	-.71
12	0.000	423.160	1.1443	-.9293	-.9013	-.0280	-3.11
12	0.000	423.160	1.1443	-.9771	-.9013	-.0758	-8.41
3	.839	430.000	1.1628	-.8730	-.8699	-.0030	-.35
4	.841	433.100	1.1712	-.8561	-.8562	.0001	.01
15	.846	444.270	1.2014	-.8329	-.8090	-.0239	-2.96
15	.846	444.270	1.2014	-.8353	-.8090	-.0263	-3.25
7	.846	444.300	1.2015	-.8283	-.8089	-.0194	-2.40
9	.848	448.160	1.2119	-.7901	-.7934	.0032	.41
9	.848	448.160	1.2119	-.7936	-.7934	-.0002	-.03
4	.850	453.500	1.2263	-.7748	-.7725	-.0022	-.29
3	.858	470.000	1.2710	-.7093	-.7124	.0031	.44
9	.859	473.160	1.2795	-.6946	-.7016	.0070	1.00
9	.859	473.160	1.2795	-.6894	-.7016	.0121	1.73
12	0.000	473.160	1.2795	-.7313	-.7016	-.0297	-4.24
12	0.000	473.160	1.2795	-.7688	-.7016	-.0672	-9.58
4	.859	474.900	1.2842	-.6944	-.6957	.0013	.19
15	.861	477.600	1.2915	-.7013	-.6867	-.0146	-2.13
15	.861	477.600	1.2915	-.7043	-.6867	-.0176	-2.57
4	.866	493.300	1.3340	-.6354	-.6371	.0017	.27
9	.868	498.160	1.3471	-.6074	-.6226	.0153	2.45
9	.868	498.160	1.3471	-.6002	-.6226	.0225	3.61
3	.869	500.000	1.3521	-.6101	-.6172	.0072	1.16

Table 4. Continued.

PROPANE SECOND VIRIAL COEFF., M = 3, E = 0.0

ID	WT	T,K	X	B*	CALC	DIF	PCT
7	.872	510.900	1.3816	-.5813	-.5865	.0052	.88
15	.873	510.940	1.3817	-.5862	-.5864	.0001	.03
15	.873	510.940	1.3817	-.5902	-.5864	-.0039	-.66
9	.876	523.160	1.4147	-.5435	-.5540	.0105	1.90
9	.876	523.160	1.4147	-.5406	-.5540	.0133	2.41
12	0.000	526.380	1.4234	-.5491	-.5458	-.0033	-.60
12	0.000	526.380	1.4234	-.5357	-.5458	.0101	1.85
9	.884	548.160	1.4823	-.4838	-.4938	.0100	2.02
9	.884	548.160	1.4823	-.4762	-.4938	.0176	3.57
3	.884	550.000	1.4873	-.4811	-.4897	.0086	1.75
12	0.000	570.460	1.5426	-.4558	-.4461	-.0097	-2.18
12	0.000	570.460	1.5426	-.4414	-.4461	.0046	1.04
12	0.000	609.320	1.6477	-.4225	-.3738	-.0488	-13.05

NP = 118, MEANDIF = .0174, RMSPCT = 1.99

Table 5. Third virial coefficients of propane.

PROPANE THIRD VIRIAL COEFF., M = 5, E = 1.0

(9) BEATTIE, (11) CHERNEY, (12) DESCHNER, (15) REAMER, (16) SAGE.

TCRT = 369.80, DCRT = .00496 MOL/CC

343.3750000

.2140090

4.8363002

ID	MT	T,K	X	C*	CALC	DIF
16	0.000	294.270	.7958	-.2586	-2.5742	2.3156
12	.291	303.160	.8198	-1.5440	-1.7673	.2233
15	.446	310.940	.8408	-1.3314	-1.2269	-.1046
15	.446	310.940	.8408	-1.5991	-1.2269	-.3722
16	0.000	310.940	.8408	.0212	-1.2269	1.2481
11	.593	323.160	.8739	-.5528	-.6089	.0562
15	.629	327.600	.8859	-.5789	-.4385	-.1404
15	.629	327.600	.8859	-.3444	-.4385	.0940
16	0.000	327.600	.8859	1.4690	-.4385	1.9074
15	.722	344.270	.9310	-.0424	.0186	-.0610
15	.722	344.270	.9310	.0492	.0186	.0306
16	0.000	344.270	.9310	1.0468	.0186	1.0282
12	.738	348.160	.9415	.7376	.0930	.6446
15	.778	360.940	.9760	.1824	.2764	-.0940
15	.778	360.940	.9760	.3198	.2764	.0435
16	0.000	360.940	.9760	.6957	.2764	.4194
9	.800	369.970	1.0005	.4785	.3622	.1163
9	.807	373.160	1.0091	.3909	.3859	.0050
11	.807	373.160	1.0091	.4704	.3859	.0845
12	.807	373.160	1.0091	.4738	.3859	.0879
15	.816	377.600	1.0211	.3058	.4139	-.1081
15	.816	377.600	1.0211	.2214	.4139	-.1925
16	0.000	377.600	1.0211	.3572	.4139	-.0567
12	.822	380.960	1.0302	.4500	.4317	.0182
9	.848	398.160	1.0767	.3826	.4872	-.1047
11	.848	398.160	1.0767	.4163	.4872	-.0710
12	.848	398.160	1.0767	.4222	.4872	-.0651
15	.862	410.940	1.1112	.4920	.5009	-.0089
15	.862	410.940	1.1112	.6150	.5009	.1141
9	.874	423.160	1.1443	.3680	.5000	-.1320
12	.874	423.160	1.1443	.4133	.5000	-.0867
15	.890	444.270	1.2014	.4721	.4793	-.0072
15	.890	444.270	1.2014	.5658	.4793	.0865
9	.893	448.160	1.2119	.3594	.4739	-.1144
9	.906	473.160	1.2795	.3535	.4327	-.0792
12	.906	473.160	1.2795	.3796	.4327	-.0531
15	.908	477.600	1.2915	.4458	.4248	.0209
15	.908	477.600	1.2915	.5166	.4248	.0918
9	.917	498.160	1.3471	.3220	.3881	-.0661
15	.922	510.940	1.3817	.4026	.3658	.0368
15	.922	510.940	1.3817	.5658	.3658	.2000
9	.926	523.160	1.4147	.3144	.3453	-.0309
12	.927	526.380	1.4234	.3405	.3400	.0005
9	.932	548.160	1.4823	.3107	.3064	.0043
12	.938	570.460	1.5426	.3085	.2756	.0329
12	.945	609.320	1.6477	.2306	.2305	.0001

NP = 46, MEANDIF = .0887, RMSPCT = 0.00



TABLE 6. Summary of P- $\rho$ -T data

<u>ID</u>	<u>Authors</u>	<u>mol/L</u>	<u>T, K</u>	<u>P, bar</u>	<u>N</u>	<u>Deviations</u>	
						<u><math>\Delta d/d, \%</math></u>	<u>Mean <math>\Delta P, \text{bar}</math></u>
1	Virial Eq. (5)	0.30 -	290 - 700	6 - 17	42	0.02	0.001
2	Dawson [16]	0.02 - 0.07	243 - 348	0.9 - 1.8	18	0.22	0.002
3	Beattie [2]	1.0 - 10.0	370 - 548	23 - 310	110	0.76	0.45
4	Deschner [18]	0.03 - 9.5	303 - 609	1.0 - 142	236	1.33	0.68
5	Reamer [51]	0.02 - 13.0	311 - 511	1.0 - 690	306	0.32	1.28
13	Cherney [10]	0.04 - 2.6	323 - 398	11 - 50	25	0.14	0.02
17	Tomlinson [66]	10.3 - 12.0	277 - 327	20 - 137	40	0.08	1.08
24	Ely [22]	11.5 - 14.8	166 - 322	2.5 - 428	222	0.06	2.49
26	Dittmar [19]	7.3 - 13.4	273 - 413	10 - 1035	336	0.36	2.94

Table 7. Coefficients of the equation of state.

EQUATION OF STATE, COEFFICIENTS

DGAT = .422162614E-09

DTRP = 16.6200, TTRP = 85.470, PTRP = .300000000E-08

DCRT = 4.9600, TCRT = 369.800, PCRT = 42.420436922

AL = 1.00, BE = 0.00000, GA = .060, DE = .750, ER = 2.00

.22566372605      1.04646227554      -.44491000068      .12708270211  
 -.59883339489

MOL/L	TSAT	THETA	PSAT	B	E
.5	300.614	284.253	10.153	.3268	-1.02265
1.0	328.391	315.776	19.216	.4196	-.85973
1.5	344.421	335.538	26.566	.5050	-.70878
2.0	354.619	348.865	32.218	.5836	-.56973
2.5	361.216	357.840	36.342	.6564	-.44259
3.0	365.406	363.674	39.186	.7240	-.32750
3.5	367.919	367.198	40.995	.7872	-.22479
4.0	369.237	369.031	41.984	.8469	-.13487
4.5	369.734	369.711	42.368	.9038	-.05827
5.0	369.800	369.800	42.420	.9586	.00450
5.5	369.710	369.673	42.349	1.0123	.05306
6.0	369.219	368.957	41.970	1.0655	.08727
6.5	368.044	367.197	41.087	1.1190	.10741
7.0	365.956	364.002	39.575	1.1736	.11428
7.5	362.776	359.046	37.379	1.2301	.10934
8.0	358.370	352.075	34.514	1.2893	.09466
8.5	352.642	342.910	31.057	1.3520	.07293
9.0	345.526	331.449	27.140	1.4189	.04721
9.5	336.982	317.665	22.937	1.4908	.02070
10.0	326.984	301.615	18.651	1.5685	-.00364
10.5	315.525	283.434	14.494	1.6527	-.02344
11.0	302.614	263.343	10.671	1.7444	-.03719
11.5	288.278	241.644	7.355	1.8442	-.04442
12.0	272.569	218.720	4.669	1.9529	-.04563
12.5	255.571	195.018	2.669	2.0713	-.04209
13.0	237.398	171.039	1.330	2.2002	-.03552
13.5	218.199	147.306	.551	2.3404	-.02765
14.0	198.142	124.332	.178	2.4926	-.01992
14.5	177.407	102.590	.040	2.6576	-.01329
15.0	156.167	82.476	.005	2.8363	-.00821
15.5	134.574	64.295	.000	3.0293	-.00469
16.0	112.747	48.247	.000	3.2375	-.00246
16.5	90.764	34.426	.000	3.4617	-.00119
17.0	68.662	22.833	.000	3.7026	-.00053

TABLE 8. Calculated  $P(\rho)$  critical isotherm

The following page gives a high-resolution examination of the critical isotherm of propane as computed by equation of state (6). Column headings have the following interpretations--

$D/DC \equiv d/d_c$ , density reduced at the critical point.

$TS/TC \equiv T_O(\rho)/T_c$ , reduced coexistence temperature.

$PS/PC \equiv P_O(\rho)/P_c$ , reduced coexistence pressure.

$P/PC \equiv P/P_c$ , pressure reduced at the critical point.

$DP/DR \equiv \partial P/\partial \rho$  slope of the critical isotherm, bar<sup>\*</sup>.

The last five columns give the density-dependence of functions used in the equation of state, where  $R \equiv \rho \equiv d/d_t$  is density reduced at the liquid triple point--

$DTS/DR \equiv dT_O(\rho)/d\rho$ , K.

$DTH/DR \equiv d\theta(\rho)/d\rho$ , K.

$DPS/DR \equiv dP_O(\rho)/d\rho$ , bar.

$DXB/DR \equiv \partial \Phi(\rho, T)/\partial \rho$ .

$DXC/DR \equiv \partial \Psi(\rho, T)/\partial \rho$ .

\*Note:  $\rho \equiv d/d_t$ , density reduced at the liquid triple-point.

Table 8. Calculated P( $\rho$ ) critical isotherm.

TC = 369.80, DC = 4.96, PC = 42.4204369. AT THE C.P., DPS/DT = .80594, DP/DT = .80594

D/DC	IS/TC	PS/PC	P/PC	DP/DR	DTS/DR	DTH/DR	DPS/DR	DXB/DR	DXE/DR
.75	.9968176568	.9787397758	.9952081566	10.918982996	45.31820	63.06948	34.02457	-1.2294	.24285
.76	.9971699500	.9810496350	.9959321863	9.679828118	42.00862	58.38180	31.65258	-1.1392	.22850
.77	.9974960057	.9831950004	.9965723206	8.533479694	38.81570	53.86442	29.34839	-1.0523	.21440
.78	.9977967614	.9851806751	.9971349869	7.477040047	35.73853	49.51686	27.11299	-0.9686	.20055
.79	.9980731493	.9870115388	.9976264073	6.507568271	32.77666	45.33902	24.94756	-0.8880	.18695
.80	.9983260991	.9886925652	.9980525951	5.622068469	29.93003	41.33123	22.83260	-0.8107	.17362
.81	.9985564223	.9902288402	.9984193506	4.817477250	27.19903	37.49417	20.83280	-0.7366	.16055
.82	.9987654150	.9916255800	.9987322557	4.090650707	24.58448	33.82896	18.80717	-0.6656	.14776
.83	.9989536616	.9928814839	.9989666681	3.438351144	22.08757	30.37055	17.01892	-0.5979	.13527
.84	.9991222375	.9940220770	.9992177138	2.857233332	19.70990	27.02028	15.23053	-0.5335	.12309
.85	.9992721128	.9950330770	.9994002796	2.343834906	17.45341	23.88080	13.52472	-0.4723	.11125
.86	.9994042743	.9959270591	.9995490039	1.894558863	15.32037	20.92106	11.90438	-0.4145	.09976
.87	.9995197284	.9967101450	.9996682673	1.505669767	13.31332	18.14379	10.37263	-0.3602	.08867
.88	.9996195028	.9973886790	.9997621823	1.173283378	11.43504	15.55189	8.93268	-0.3093	.07799
.89	.9997046484	.9979692367	.9998345831	.8933633085	9.68844	13.14844	7.58786	-0.2621	.06776
.90	.9997762404	.9984586300	.9998890141	.661719789	8.07659	10.93656	6.34157	-0.2185	.05802
.91	.999833783	.9988639091	.9999287200	.474016687	6.60252	8.91942	5.19718	-0.1786	.04882
.92	.9998832720	.9991929491	.9999566661	.325604258	5.26672	7.09756	4.15602	-0.1424	.04018
.93	.9999208798	.9994519608	.9999753963	.212282820	4.07742	5.47928	3.22547	-0.1103	.03220
.94	.9999494780	.9996494050	.9999872431	.129139706	3.03455	4.06456	2.40640	-0.0821	.02489
.95	.9999702587	.9997932281	.9999941629	.071421791	2.14059	2.85591	1.70167	-0.0579	.01834
.96	.9999844334	.9998915713	.9999977657	.034355708	1.39783	1.85564	1.11396	-0.0378	.01260
.97	.9999932312	.9999527614	.9999993697	.013200933	.80847	1.06600	.64592	-0.0219	.00775
.98	.9999979003	.9999853173	.9999998979	.003318187	.37510	.48955	.30046	-0.0101	.00390
.99	.9999997437	.9999982041	.9999999967	.000246968	.09478	.12339	.07614	-0.0026	.00112
1.00	1.0000000000	1.0000000000	1.0000000000	.000000000	.00000	.00000	.00000	-0.0000	0.00000
1.01	.9999997999	.9999985973	1.0000000092	.000585195	-.07837	-.10699	-.06297	.00021	-.00093
1.02	.9999980998	.9999867106	1.0000002158	.006298928	-.33845	-.45291	-.27115	.00092	-.00353
1.03	.9999939322	.9999576443	1.0000011324	.021962291	-.71970	-.97723	-.57516	.00195	-.00692
1.04	.9999859898	.9999023860	1.0000037178	.053796919	-1.23950	-1.69732	-.98814	.00335	-.01121
1.05	.9999735039	.9998157226	1.0000092229	.106753803	-1.87488	-2.59020	-1.49116	.00507	-.01613
1.06	.9999554102	.9996904271	1.0000193781	.186993570	-2.62861	-3.65863	-2.08578	.00711	-.02166
1.07	.9999307684	.9995201787	1.0000363159	.30060603	-3.49713	-4.89902	-2.76856	.00946	-.02775
1.08	.9998986647	.9992588849	1.0000626038	.453872804	-4.47737	-6.30826	-3.53644	.01211	-.03435
1.09	.9998802088	.9990206582	1.0001012604	.653332314	-5.56656	-7.88357	-4.38663	.01506	-.04141
1.10	.9998085318	.9986798007	1.0001557715	.905735513	-6.76222	-9.62238	-5.31652	.01829	-.04889
1.11	.9997487838	.9982707927	1.0002301064	1.218082253	-8.06201	-11.52232	-6.32364	.02181	-.05676
1.12	.9996781335	.9977882853	1.0003287359	1.597624317	-9.46373	-13.58110	-7.40560	.02560	-.06500
1.13	.9995957668	.9972270946	1.0004566500	2.051873087	-10.96530	-15.79654	-8.56010	.02966	-.07358
1.14	.9995008859	.9965821979	1.0006193765	2.588606532	-12.56471	-18.16652	-9.78486	.03399	-.08247
1.15	.9993927094	.9958487310	1.0008229998	3.215875388	-14.25999	-20.68898	-11.07764	.03858	-.09165
1.16	.9992704710	.9950219866	1.0010741808	3.942008680	-16.04926	-23.36188	-12.43623	.04343	-.10109
1.17	.9991334199	.9940974127	1.0013801759	4.775618538	-17.93066	-26.18319	-13.85842	.04853	-.11079
1.18	.9989808200	.9930706130	1.0017488577	5.725604321	-19.90235	-29.15092	-15.34199	.05387	-.12073
1.19	.9988119498	.9919373457	1.0021887351	6.801156081	-21.96254	-32.26308	-16.88476	.05946	-.13087
1.20	.9986261023	.9906935247	1.0027089736	8.011757373	-24.10945	-35.51767	-18.48450	.06529	-.14122
1.21	.9984225848	.9893352194	1.0033194166	9.367187418	-26.34134	-38.91270	-20.13900	.07134	-.15175
1.22	.9982007185	.9878586553	1.0040306057	10.877522641	-28.65644	-42.44616	-21.84604	.07763	-.16245
1.23	.9979598389	.9862602153	1.0048538020	12.553137592	-31.05304	-46.11604	-23.60338	.08114	-.17331

TABLE 9. Comparisons with P- $\rho$ -T data

The following pages compare experimental P- $\rho$ -T (compressibility) data with densities and pressures computed by the equation of state (6). The first column identifies sources of the data (as in table 6):

<u>ID</u>	<u>Authors</u>	<u>Reference</u>
1	Virial equation	This report
2	Dawson and McKetta	[16]
3	Beattie, Kay and Kaminsky	[2]
4	Deschner and Brown	[18]
5	Reamer, Sage and Lacey	[50]
13	Cherney, Marchman and York	[10]
17	Tomlinson	[65]
24	Ely and Kabayashi	[22]
26	Dittmar, Schulz and Strese	[19]



Table 9. Comparisons with P-p-T data.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
1	290.000	.3000	.2998	.06	6.339	6.343	-.003
1	300.000	.3000	.2998	.05	6.624	6.627	-.003
1	310.000	.3000	.2999	.04	6.906	6.908	-.003
1	320.000	.3000	.2999	.03	7.185	7.187	-.002
1	330.000	.3000	.2999	.02	7.462	7.464	-.001
1	340.000	.3000	.3000	.01	7.738	7.739	-.001
1	350.000	.3000	.3000	.01	8.012	8.012	-.001
1	360.000	.3000	.3000	.00	8.284	8.284	-.000
1	370.000	.3000	.3000	.00	8.555	8.555	-.000
1	380.000	.3000	.3000	.00	8.825	8.825	-.000
1	390.000	.3000	.3000	0.00	9.094	9.094	.000
1	400.000	.3000	.3000	.00	9.362	9.362	-.000
1	410.000	.3000	.3000	.00	9.629	9.629	-.000
1	420.000	.3000	.3000	.00	9.895	9.896	-.000
1	430.000	.3000	.3000	.00	10.161	10.161	-.000
1	440.000	.3000	.3000	.01	10.426	10.427	-.000
1	450.000	.3000	.3000	.01	10.691	10.691	-.001
1	460.000	.3000	.3000	.01	10.955	10.955	-.001
1	470.000	.3000	.3000	.01	11.218	11.219	-.001
1	480.000	.3000	.3000	.01	11.481	11.482	-.001
1	490.000	.3000	.3000	.01	11.744	11.745	-.001
1	500.000	.3000	.3000	.01	12.006	12.007	-.002
1	510.000	.3000	.3000	.01	12.268	12.269	-.002
1	520.000	.3000	.3000	.01	12.529	12.531	-.002
1	530.000	.3000	.3000	.01	12.791	12.792	-.002
1	540.000	.3000	.3000	.02	13.052	13.054	-.002
1	550.000	.3000	.3000	.01	13.312	13.314	-.002
1	560.000	.3000	.3000	.01	13.573	13.575	-.002
1	570.000	.3000	.3000	.01	13.833	13.835	-.002
1	580.000	.3000	.3000	.01	14.093	14.095	-.002
1	590.000	.3000	.3000	.01	14.353	14.355	-.002
1	600.000	.3000	.3000	.01	14.613	14.614	-.002
1	610.000	.3000	.3000	.01	14.872	14.874	-.001
1	620.000	.3000	.3000	.01	15.132	15.133	-.001
1	630.000	.3000	.3000	.01	15.391	15.392	-.001
1	640.000	.3000	.3000	.00	15.650	15.651	-.001
1	650.000	.3000	.3000	.00	15.909	15.909	-.000
1	660.000	.3000	.3000	-.00	16.168	16.168	.000
1	670.000	.3000	.3000	-.00	16.427	16.426	.000
1	680.000	.3000	.3000	-.01	16.685	16.684	.001
1	690.000	.3000	.3000	-.01	16.944	16.942	.001
1	700.000	.3000	.3000	-.01	17.202	17.200	.002

NP = 42, ONRMSPCT = .017, PMEANDIF = .001

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
2	243.150	.0451	.0452	-.22	.887	.885	.002
2	243.150	.0596	.0597	-.14	1.161	1.159	.002
2	258.150	.0595	.0596	-.17	1.237	1.235	.002
2	258.150	.0451	.0452	-.19	.945	.943	.002
2	273.150	.0707	.0708	-.20	1.552	1.549	.003
2	273.150	.0451	.0452	-.25	1.003	1.001	.002
2	273.150	.0596	.0597	-.19	1.316	1.313	.002
2	288.150	.0593	.0594	-.18	1.386	1.383	.002
2	288.150	.0206	.0207	-.28	.490	.489	.001
2	288.150	.0451	.0452	-.21	1.060	1.058	.002
2	288.150	.0707	.0708	-.21	1.643	1.640	.003
2	288.150	.0370	.0371	-.31	.874	.872	.003
2	323.150	.0370	.0371	-.21	.983	.981	.002
2	323.150	.0700	.0702	-.21	1.838	1.835	.004
2	323.150	.0207	.0207	-.12	.551	.551	.001
2	323.150	.0451	.0452	-.24	1.193	1.190	.003
2	348.150	.0595	.0596	-.22	1.694	1.690	.004
2	348.150	.0451	.0452	-.31	1.290	1.286	.004

NP = 18, DNRMSPT = .220, PMEANDIF = .002

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
13	323.150	.4735	.4738	-.07	10.801	10.795	.006
13	323.150	.4940	.4944	-.07	11.186	11.180	.006
13	323.150	.5325	.5333	-.14	11.896	11.882	.013
13	323.150	.5586	.5584	.04	12.341	12.345	-.004
13	323.150	.5774	.5782	-.13	12.686	12.673	.013
13	323.150	.6082	.6086	-.06	13.203	13.196	.007
13	323.150	.6307	.6312	-.09	13.578	13.569	.009
13	323.150	.6947	.6955	-.12	14.601	14.588	.013
13	323.150	.7732	.7734	-.03	15.756	15.753	.003
13	323.150	.8718	.8726	-.09	17.094	17.084	.010
13	373.150	.3833	.3839	-.17	10.832	10.815	.016
13	373.150	.4063	.4071	-.19	11.419	11.400	.020
13	373.150	.4617	.4625	-.18	12.797	12.777	.020
13	373.150	.5344	.5350	-.10	14.540	14.528	.013
13	373.150	.6344	.6353	-.14	16.840	16.821	.019
13	373.150	.7805	.7814	-.12	19.971	19.952	.019
13	373.150	1.0140	1.0138	.01	24.429	24.432	-.002
13	373.150	1.4466	1.4445	.15	31.127	31.155	-.028
13	373.150	2.5197	2.5281	-.34	40.733	40.689	.044
13	398.150	.5354	.5364	-.20	15.847	15.820	.028
13	398.150	.6362	.6372	-.14	18.431	18.408	.023
13	398.150	.7841	.7850	-.11	22.018	21.997	.021
13	398.150	1.0214	1.0214	.00	27.267	27.267	-.000
13	398.150	1.4643	1.4612	.21	35.565	35.616	-.051
13	398.150	2.5805	2.5810	-.02	49.781	49.776	.005

NP = 25, DNRMSPT = .137, PMEANDIF = .016



Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
3	369.960	.9992	.9898	.94	23.659	23.826	-.166
3	373.150	.9992	.9947	.46	24.085	24.167	-.082
3	398.150	.9992	.9978	.14	26.770	26.799	-.029
3	423.150	.9992	.9985	.08	29.354	29.372	-.018
3	448.150	.9992	.9987	.05	31.887	31.900	-.013
3	473.150	.9992	.9995	-.03	34.400	34.392	.008
3	498.150	.9992	1.0003	-.11	36.892	36.856	.037
3	523.150	.9992	.9989	.03	39.284	39.295	-.012
3	548.150	.9992	1.0008	-.16	41.776	41.715	.061
3	369.960	1.4988	1.4841	.98	31.087	31.269	-.183
3	373.150	1.4988	1.4893	.64	31.715	31.838	-.123
3	398.150	1.4988	1.4940	.32	36.112	36.192	-.080
3	423.150	1.4988	1.4940	.32	40.317	40.414	-.097
3	448.150	1.4988	1.4946	.28	44.441	44.541	-.100
3	473.150	1.4988	1.4955	.22	48.504	48.594	-.090
3	498.150	1.4988	1.4964	.16	52.517	52.589	-.073
3	523.150	1.4988	1.4937	.34	56.367	56.537	-.170
3	548.150	1.4988	1.4984	.03	60.430	60.444	-.014
3	369.960	1.9984	1.9963	.11	36.295	36.312	-.017
3	373.150	1.9984	1.9874	.55	37.044	37.139	-.095
3	398.150	1.9984	1.9919	.33	43.357	43.440	-.083
3	423.150	1.9984	1.9905	.40	49.386	49.517	-.131
3	448.150	1.9984	1.9911	.37	55.293	55.442	-.149
3	473.150	1.9984	1.9912	.36	61.079	61.252	-.174
3	498.150	1.9984	1.9927	.29	66.814	66.973	-.159
3	523.150	1.9984	1.9938	.23	72.478	72.621	-.143
3	548.150	1.9984	1.9954	.15	78.101	78.208	-.106
3	373.150	2.4980	2.4993	-.05	40.581	40.574	.007
3	398.150	2.4980	2.4928	.21	48.940	48.991	-.051
3	423.150	2.4980	2.4897	.33	56.975	57.091	-.116
3	448.150	2.4980	2.4886	.38	64.818	64.988	-.170
3	473.150	2.4980	2.4881	.40	72.518	72.737	-.218
3	498.150	2.4980	2.4888	.37	80.128	80.369	-.242
3	523.150	2.4980	2.4903	.31	87.677	87.908	-.232
3	548.150	2.4980	2.4917	.25	95.154	95.369	-.215
3	369.960	2.9976	3.0204	-.76	41.300	41.244	.056
3	373.150	2.9976	3.0153	-.59	42.708	42.654	.055
3	398.150	2.9976	2.9961	.05	53.287	53.299	-.012
3	423.150	2.9976	2.9871	.35	63.429	63.557	-.127
3	448.150	2.9976	2.9853	.41	73.380	73.583	-.203
3	473.150	2.9976	2.9991	-.05	83.472	83.441	.030
3	498.150	2.9976	2.9860	.39	92.874	93.170	-.295
3	523.150	2.9976	2.9871	.35	102.480	102.793	-.313
3	548.150	2.9976	2.9881	.32	112.005	112.327	-.323
3	373.150	3.4972	3.5298	-.93	43.884	43.829	.054
3	398.150	3.4972	3.4947	.07	56.752	56.768	-.016
3	423.150	3.4972	3.4827	.42	69.144	69.305	-.161
3	448.150	3.4972	3.4815	.45	81.364	81.613	-.249
3	473.150	3.4972	3.4814	.45	93.432	93.756	-.324
3	498.150	3.4972	3.4825	.42	105.398	105.771	-.373
3	523.150	3.4972	3.4837	.39	117.274	117.681	-.407
3	548.150	3.4972	3.4848	.36	129.068	129.502	-.434
3	369.960	3.9968	4.1229	-3.15	42.486	42.450	.036
3	373.150	3.9968	4.0383	-1.04	44.502	44.464	.038
3	398.150	3.9968	3.9793	.44	59.650	59.750	-.100

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE, (4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
3	423.150	3.9968	3.9731	.59	74.443	74.697	-.254
3	448.150	3.9968	3.9753	.54	89.115	89.456	-.340
3	473.150	3.9968	3.9767	.50	103.655	104.077	-.422
3	498.150	3.9968	3.9791	.44	118.125	118.590	-.465
3	523.150	3.9968	3.9813	.39	132.523	133.011	-.488
3	548.150	3.9968	3.9856	.28	146.942	147.354	-.412
3	373.150	4.4964	4.4793	.38	44.826	44.837	-.011
3	398.150	4.4964	4.4509	1.01	62.305	62.562	-.257
3	423.150	4.4964	4.4566	.89	79.652	80.090	-.439
3	448.150	4.4964	4.4658	.68	96.998	97.506	-.508
3	473.150	4.4964	4.4717	.55	114.284	114.836	-.551
3	498.150	4.4964	4.4757	.46	131.510	132.092	-.582
3	523.150	4.4964	4.4790	.39	148.694	149.283	-.589
3	548.150	4.4964	4.4811	.34	165.808	166.416	-.607
3	373.150	4.9961	4.8441	3.04	45.049	45.143	-.094
3	398.150	4.9961	4.9092	1.74	64.959	65.486	-.526
3	423.150	4.9961	4.9375	1.17	85.133	85.834	-.701
3	448.150	4.9961	4.9556	.81	105.439	106.172	-.733
3	473.150	4.9961	4.9663	.60	125.765	126.492	-.727
3	498.150	4.9961	4.9414	1.09	145.108	146.787	-1.680
3	523.150	4.9961	4.9504	.91	165.352	167.054	-1.701
3	548.150	4.9961	4.9825	.27	186.691	187.288	-.597
3	369.960	5.9953	5.9730	.37	42.708	42.721	-.013
3	373.150	5.9953	5.7853	3.50	45.758	46.027	-.269
3	398.150	5.9953	5.8792	1.94	71.657	72.648	-.991
3	423.150	5.9953	5.9309	1.07	98.680	99.730	-1.050
3	448.150	5.9953	5.9595	.60	126.170	127.040	-.870
3	473.150	5.9953	5.9760	.32	153.862	154.488	-.626
3	498.150	5.9953	5.9852	.17	181.615	182.024	-.409
3	523.150	5.9953	5.9911	.07	209.408	209.613	-.205
3	548.150	5.9953	5.9944	.01	237.182	237.231	-.050
3	369.960	6.9945	6.9294	.93	44.725	45.043	-.319
3	373.150	6.9945	6.9025	1.32	48.910	49.476	-.566
3	398.150	6.9945	6.9253	.99	83.826	84.992	-1.166
3	423.150	6.9945	6.9577	.53	120.192	121.212	-1.021
3	448.150	6.9945	6.9798	.21	157.246	157.816	-.570
3	473.150	6.9945	6.9978	-.05	194.828	194.664	.164
3	498.150	6.9945	7.0018	-.10	232.115	231.672	.443
3	523.150	6.9945	7.0056	-.16	269.585	268.783	.802
3	548.150	6.9945	7.0076	-.19	307.045	305.958	1.088
3	369.960	7.9937	7.9485	.56	55.587	56.471	-.884
3	373.150	7.9937	7.9429	.63	61.504	62.596	-1.092
3	398.150	7.9937	7.9495	.55	109.472	111.102	-1.630
3	423.150	7.9937	7.9715	.28	159.019	160.177	-1.158
3	448.150	7.9937	7.9857	.10	209.044	209.585	-.542
3	473.150	7.9937	7.9972	-.04	259.493	259.200	.294
3	498.150	7.9937	8.0029	-.11	309.832	308.937	.895
3	369.960	8.9929	8.9666	.29	90.068	91.471	-1.403
3	373.150	8.9929	8.9604	.36	98.123	99.940	-1.817
3	398.150	8.9929	8.9686	.27	164.623	166.491	-1.868
3	423.150	8.9929	8.9781	.16	231.801	233.245	-1.444
3	448.150	8.9929	8.9809	.13	298.676	300.086	-1.410
3	369.960	9.9921	9.9875	.05	173.357	173.890	-.533
3	373.150	9.9921	9.9786	.13	183.824	185.438	-1.614
3	398.150	9.9921	9.9776	.15	273.699	275.832	-2.133

NP = 110, DNRMSPT = .763, PMEANDIF = .448

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
4	303.150	.0406	.0409	-.82	1.013	1.005	.008
4	348.150	.0352	.0354	-.73	1.013	1.006	.007
4	373.150	.0327	.0330	-.76	1.013	1.006	.008
4	380.950	.0320	.0323	-.81	1.013	1.005	.008
4	303.150	.0825	.0831	-.77	2.027	2.011	.015
4	348.150	.0711	.0716	-.73	2.027	2.012	.014
4	303.150	.1258	.1268	-.77	3.040	3.018	.022
4	380.950	.0975	.0984	-.88	3.040	3.014	.026
4	303.150	.1707	.1720	-.76	4.053	4.025	.028
4	348.150	.1452	.1462	-.67	4.053	4.027	.026
4	303.150	.2174	.2190	-.77	5.066	5.031	.036
4	373.150	.1696	.1704	-.53	5.066	5.041	.025
4	380.950	.1650	.1665	-.90	5.066	5.023	.043
4	398.150	.1575	.1585	-.60	5.066	5.037	.029
4	303.150	.2661	.2681	-.74	6.080	6.040	.040
4	348.150	.2227	.2241	-.66	6.080	6.042	.037
4	303.150	.3173	.3194	-.64	7.093	7.053	.039
4	303.150	.3714	.3733	-.50	8.106	8.072	.034
4	348.150	.3038	.3060	-.71	8.106	8.054	.052
4	303.150	.4293	.4302	-.20	9.119	9.104	.015
4	303.150	.4927	.4907	.42	10.133	10.166	-.034
4	348.150	.3893	.3922	-.75	10.133	10.066	.067
4	373.150	.3552	.3567	-.43	10.133	10.093	.039
4	380.950	.3435	.3473	-1.10	10.133	10.031	.101
4	398.150	.3267	.3284	-.50	10.133	10.086	.047
4	348.150	.4801	.4835	-.71	12.159	12.086	.073
4	348.150	.5766	.5807	-.72	14.186	14.102	.084
4	373.150	.5619	.5631	-.23	15.199	15.169	.030
4	380.950	.5393	.5457	-1.19	15.199	15.043	.156
4	398.150	.5056	.5118	-1.24	15.199	15.033	.166
4	348.150	.6800	.6849	-.72	16.212	16.121	.091
4	348.150	.7919	.7976	-.72	18.239	18.141	.098
4	348.150	.9146	.9209	-.69	20.265	20.166	.099
4	373.150	.7955	.7958	-.04	20.265	20.259	.006
4	380.950	.7582	.7665	-1.09	20.265	20.087	.178
4	398.150	.7087	.7115	-.40	20.265	20.196	.069
4	348.150	1.0520	1.0582	-.59	22.292	22.206	.086
4	348.150	1.2083	1.2145	-.52	24.318	24.242	.076
4	373.150	1.0651	1.0652	-.00	25.331	25.331	.000
4	380.950	1.0057	1.0169	-1.12	25.331	25.119	.212
4	398.150	.9280	.9311	-.34	25.331	25.262	.069
4	348.150	1.3982	1.3997	-.11	26.345	26.329	.015
4	348.150	1.6167	1.6355	-1.17	28.371	28.231	.140
4	373.150	1.3908	1.3909	-.01	30.398	30.396	.001
4	380.950	1.2924	1.3097	-1.34	30.398	30.122	.276
4	398.150	1.1722	1.1762	-.34	30.398	30.320	.078
4	373.150	1.8069	1.8176	-.60	35.464	35.356	.108
4	380.950	1.6407	1.6688	-1.71	35.464	35.109	.355
4	398.150	1.4513	1.4552	-.27	35.464	35.397	.067
4	373.150	2.4358	2.4899	-2.22	40.530	40.230	.300
4	380.950	2.0992	2.1475	-2.30	40.530	40.095	.435
4	398.150	1.7758	1.7816	-.33	40.530	40.447	.083
4	373.150	5.2163	5.6236	-7.81	45.596	45.285	.312
4	380.950	2.7381	2.9045	-6.08	45.596	44.724	.872
4	398.150	2.1608	2.1771	-.76	45.596	45.407	.189



Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE, (4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)EL, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
4	373.150	6.6556	6.6336	.33	47.623	47.710	-.088
4	373.150	6.8813	6.8534	.41	48.636	48.789	-.153
4	373.150	7.0652	7.0204	.63	49.649	49.963	-.314
4	373.150	7.2126	7.1562	.78	50.663	51.141	-.478
4	380.950	4.0759	4.6185	-13.31	50.663	49.480	1.183
4	398.150	2.6405	2.6779	-1.42	50.663	50.327	.335
4	373.150	7.6747	7.6137	.79	55.729	56.642	-.914
4	380.950	6.0778	6.3385	-4.29	55.729	54.563	1.166
4	398.150	3.2869	3.3377	-1.54	55.729	55.386	.343
4	380.950	6.4720	6.6760	-3.15	57.755	56.449	1.306
4	380.950	6.7741	6.9257	-2.24	59.782	58.489	1.293
4	373.150	8.0075	7.9084	1.24	60.795	62.902	-2.107
4	380.950	6.9064	7.0296	-1.78	60.795	59.605	1.190
4	398.150	4.1339	4.1818	-1.16	60.795	60.526	.269
4	373.150	8.2346	8.1310	1.26	65.861	68.646	-2.785
4	380.950	7.3254	7.4271	-1.39	65.861	64.361	1.500
4	398.150	5.0440	5.0570	-.26	65.861	65.780	.081
4	373.150	8.4085	8.3120	1.15	70.928	74.021	-3.093
4	380.950	7.6371	7.7095	-.95	70.928	69.491	1.437
4	398.150	5.7737	5.7891	-.27	70.928	70.806	.122
4	373.150	8.5653	8.4657	1.16	75.994	79.696	-3.702
4	380.950	7.8616	7.9306	-.88	75.994	74.296	1.698
4	398.150	6.3197	6.3387	-.30	75.994	75.790	.204
4	373.150	8.6725	8.5998	.84	81.060	84.077	-3.017
4	380.950	8.0512	8.1135	-.77	81.060	79.238	1.822
4	398.150	6.7336	6.7452	-.17	81.060	80.894	.166
4	373.150	8.8057	8.7193	.98	86.126	90.143	-4.016
4	380.950	8.2288	8.2702	-.50	86.126	84.720	1.407
4	398.150	7.0839	7.0584	.36	86.126	86.593	-.467
4	373.150	8.9167	8.8273	1.00	91.193	95.764	-4.571
4	380.950	8.3688	8.4077	-.46	91.193	89.699	1.494
4	398.150	7.3594	7.3109	.66	91.193	92.285	-1.093
4	373.150	9.0158	8.9260	1.00	96.259	101.249	-4.990
4	380.950	8.4911	8.5306	-.47	96.259	94.571	1.688
4	398.150	7.5987	7.5218	1.01	96.259	98.324	-2.065
4	373.150	9.1094	9.0171	1.01	101.325	106.864	-5.539
4	380.950	8.6018	8.6419	-.47	101.325	99.446	1.879
4	398.150	7.7738	7.7029	.91	101.325	103.511	-2.186
4	373.150	9.1859	9.1018	.92	106.391	111.780	-5.389
4	380.950	8.6977	8.7438	-.53	106.391	104.048	2.343
4	398.150	7.9393	7.8617	.98	106.391	109.104	-2.713
4	373.150	9.2566	9.1810	.82	111.458	116.598	-5.140
4	380.950	8.7868	8.8379	-.58	111.458	108.658	2.799
4	398.150	8.0823	8.0031	.98	111.458	114.541	-3.083
4	373.150	9.3197	9.2555	.69	116.524	121.136	-4.612
4	380.950	8.8762	8.9255	-.55	116.524	113.631	2.893
4	398.150	8.2040	8.1308	.89	116.524	119.652	-3.129
4	373.150	9.3761	9.3259	.54	121.590	125.382	-3.792
4	380.950	8.9598	9.0073	-.53	121.590	118.608	2.982
4	398.150	8.3150	8.2473	.81	121.590	124.739	-3.149
4	373.150	9.4308	9.3925	.41	126.656	129.678	-3.022
4	380.950	9.0381	9.0843	-.51	126.656	123.576	3.080
4	398.150	8.4123	8.3545	.69	126.656	129.558	-2.902
4	373.150	9.4860	9.4560	.32	131.723	134.210	-2.488
4	380.950	9.1196	9.1571	-.41	131.723	129.078	2.645
4	398.150	8.5006	8.4539	.55	131.723	134.234	-2.512

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
4	398.150	8.6558	8.6333	.26	141.855	143.220	-1.365
4	423.150	.0288	.0290	-.75	1.013	1.006	.007
4	473.150	.0257	.0259	-.74	1.013	1.006	.007
4	526.370	.0231	.0232	-.76	1.013	1.006	.008
4	423.150	.0874	.0880	-.65	3.040	3.020	.019
4	473.150	.0777	.0783	-.69	3.040	3.019	.021
4	526.370	.0696	.0701	-.77	3.040	3.017	.023
4	423.150	.1474	.1482	-.56	5.066	5.039	.027
4	473.150	.1306	.1314	-.62	5.066	5.035	.031
4	526.370	.1165	.1174	-.78	5.066	5.028	.039
4	423.150	.3036	.3049	-.42	10.133	10.092	.040
4	473.150	.2665	.2678	-.48	10.133	10.086	.046
4	526.370	.2361	.2379	-.73	10.133	10.061	.072
4	423.150	.4692	.4712	-.43	15.199	15.139	.060
4	473.150	.4080	.4095	-.35	15.199	15.149	.050
4	526.370	.3588	.3614	-.71	15.199	15.096	.103
4	570.450	.3278	.3301	-.69	15.199	15.097	.101
4	423.150	.6456	.6483	-.42	20.265	20.189	.076
4	473.150	.5554	.5567	-.24	20.265	20.220	.045
4	526.370	.4850	.4879	-.60	20.265	20.150	.115
4	570.450	.4415	.4441	-.60	20.265	20.148	.117
4	423.150	.8347	.8378	-.37	25.331	25.252	.080
4	473.150	.7085	.7098	-.18	25.331	25.290	.041
4	526.370	.6144	.6175	-.51	25.331	25.209	.122
4	570.450	.5572	.5601	-.51	25.331	25.209	.123
4	423.150	1.0383	1.0418	-.34	30.398	30.314	.084
4	473.150	.8677	.8690	-.15	30.398	30.356	.041
4	526.370	.7469	.7502	-.44	30.398	30.273	.124
4	570.450	.6751	.6778	-.41	30.398	30.280	.118
4	423.150	1.2577	1.2629	-.41	35.464	35.350	.113
4	473.150	1.0340	1.0349	-.08	35.464	35.439	.024
4	526.370	.8825	.8859	-.38	35.464	35.340	.124
4	570.450	.7952	.7974	-.28	35.464	35.371	.092
4	423.150	1.4981	1.5046	-.43	40.530	40.400	.130
4	473.150	1.2074	1.2078	-.03	40.530	40.520	.010
4	526.370	1.0215	1.0247	-.31	40.530	40.414	.116
4	570.450	.9171	.9186	-.16	40.530	40.467	.063
4	609.310	.8460	.8450	.12	40.530	40.577	-.047
4	423.150	1.7663	1.7714	-.29	45.596	45.503	.093
4	473.150	1.3895	1.3883	.09	45.596	45.630	-.033
4	526.370	1.1635	1.1666	-.27	45.596	45.486	.110
4	570.450	1.0405	1.0415	-.10	45.596	45.554	.042
4	423.150	2.0642	2.0686	-.21	50.663	50.592	.071
4	473.150	1.5797	1.5768	.18	50.663	50.739	-.076
4	526.370	1.3088	1.3117	-.22	50.663	50.563	.099
4	570.450	1.1653	1.1661	-.07	50.663	50.629	.034
4	609.310	1.0698	1.0676	.21	50.663	50.762	-.100
4	423.150	2.3924	2.4017	-.39	55.729	55.595	.133
4	473.150	1.7769	1.7738	.18	55.729	55.808	-.079
4	526.370	1.4559	1.4599	-.27	55.729	55.595	.134
4	570.450	1.2914	1.2922	-.06	55.729	55.697	.032
4	423.150	2.7508	2.7757	-.91	60.795	60.475	.320
4	473.150	1.9809	1.9794	.08	60.795	60.832	-.037
4	526.370	1.6062	1.6112	-.31	60.795	60.631	.164
4	570.450	1.4182	1.4199	-.11	60.795	60.731	.064
4	609.310	1.2968	1.2937	.23	60.795	60.930	-.135

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
4	423.150	3.1495	3.1923	-1.36	65.861	65.363	.498
4	473.150	2.1930	2.1938	-.04	65.861	65.842	.019
4	526.370	1.7595	1.7655	-.34	65.861	65.668	.193
4	570.450	1.5468	1.5489	-.14	65.861	65.777	.084
4	423.150	3.5957	3.6456	-1.39	70.928	70.384	.543
4	473.150	2.4142	2.4166	-.10	70.928	70.874	.053
4	526.370	1.9156	1.9226	-.36	70.928	70.705	.223
4	570.450	1.6759	1.6793	-.20	70.928	70.795	.132
4	609.310	1.5253	1.5229	.16	70.928	71.036	-.108
4	423.150	4.0764	4.1182	-1.03	75.994	75.547	.447
4	473.150	2.6418	2.6471	-.20	75.994	75.879	.114
4	526.370	2.0741	2.0823	-.39	75.994	75.737	.257
4	570.450	1.8064	1.8109	-.25	75.994	75.822	.172
4	423.150	4.5576	4.5838	-.57	81.060	80.768	.292
4	473.150	2.8761	2.8842	-.28	81.060	80.888	.172
4	526.370	2.2352	2.2443	-.41	81.060	80.777	.283
4	570.450	1.9367	1.9435	-.35	81.060	80.801	.259
4	609.310	1.7548	1.7543	.02	81.060	81.079	-.019
4	423.150	5.0038	5.0202	-.33	86.126	85.928	.199
4	473.150	3.1176	3.1266	-.29	86.126	85.939	.187
4	526.370	2.3991	2.4084	-.39	86.126	85.842	.284
4	570.450	2.0695	2.0770	-.36	86.126	85.844	.283
4	423.150	5.3890	5.4187	-.55	91.193	90.797	.396
4	473.150	3.3617	3.3723	-.32	91.193	90.973	.219
4	526.370	2.5661	2.5740	-.31	91.193	90.950	.242
4	570.450	2.2027	2.2112	-.39	91.193	90.870	.323
4	609.310	1.9866	1.9874	-.04	91.193	91.160	.033
4	423.150	5.7401	5.7754	-.62	96.259	95.728	.531
4	473.150	3.6068	3.6192	-.34	96.259	96.005	.253
4	526.370	2.7330	2.7408	-.29	96.259	96.022	.236
4	570.450	2.3344	2.3459	-.49	96.259	95.828	.431
4	423.150	6.0562	6.0898	-.55	101.325	100.751	.574
4	473.150	3.8538	3.8648	-.28	101.325	101.098	.227
4	526.370	2.9008	2.9083	-.26	101.325	101.099	.226
4	570.450	2.4679	2.4809	-.53	101.325	100.837	.488
4	609.310	2.2179	2.2210	-.14	101.325	101.191	.134
4	423.150	6.3403	6.3649	-.39	106.391	105.910	.482
4	473.150	4.1002	4.1068	-.16	106.391	106.253	.139
4	526.370	3.0679	3.0759	-.26	106.391	106.149	.243
4	570.450	2.6012	2.6159	-.57	106.391	105.840	.552
4	423.150	6.5893	6.6060	-.25	111.458	111.086	.371
4	473.150	4.3465	4.3430	.08	111.458	111.534	-.077
4	526.370	3.2337	3.2432	-.29	111.458	111.169	.288
4	570.450	2.7347	2.7508	-.59	111.458	110.850	.607
4	609.310	2.4479	2.4543	-.26	111.458	111.178	.280
4	423.150	6.8147	6.8187	-.06	116.524	116.423	.101
4	473.150	4.5909	4.5717	.42	116.524	116.956	-.432
4	526.370	3.3998	3.4096	-.29	116.524	116.224	.300
4	570.450	2.8691	2.8854	-.57	116.524	115.909	.615
4	423.150	7.0166	7.0079	.12	121.590	121.837	-.247
4	473.150	4.8342	4.7918	.88	121.590	122.590	-1.000
4	526.370	3.5627	3.5746	-.33	121.590	121.222	.368
4	570.450	3.0009	3.0193	-.61	121.590	120.891	.699
4	609.310	2.6764	2.6863	-.37	121.590	121.156	.434
4	423.150	7.1842	7.1776	.09	126.656	126.862	-.206
4	473.150	5.0699	5.0028	1.33	126.656	128.319	-1.662

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
4	526.370	3.7280	3.7378	-.26	126.656	126.351	.306
4	570.450	3.1344	3.1524	-.58	126.656	125.968	.689
4	423.150	7.3360	7.3313	.06	131.723	131.886	-.164
4	473.150	5.2988	5.2044	1.78	131.723	134.178	-2.456
4	526.370	3.8897	3.8986	-.23	131.723	131.441	.281
4	570.450	3.2663	3.2845	-.56	131.723	131.021	.701
4	609.310	2.9034	2.9160	-.43	131.723	131.162	.560
4	423.150	7.4680	7.4714	-.05	136.789	136.658	.130
4	473.150	5.5184	5.3967	2.21	136.789	140.131	-3.342
4	526.370	4.0535	4.0566	-.07	136.789	136.690	.098
4	570.450	3.3980	3.4154	-.51	136.789	136.110	.679
4	423.150	7.5848	7.6002	-.20	141.855	141.227	.628
4	609.310	3.1267	3.1425	-.50	141.855	141.144	.711

NP = 236, DNRMSPT = 1.333, PMEANDIF = .682



Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCO	D,PCT	P,BAR	CALCO	P,DIF
5	310.928	.0397	.0398	-.29	1.013	1.010	.003
5	327.594	.0376	.0377	-.26	1.013	1.011	.003
5	344.261	.0358	.0358	-.23	1.013	1.011	.002
5	360.928	.0341	.0341	-.21	1.013	1.011	.002
5	377.594	.0325	.0326	-.18	1.013	1.011	.002
5	410.928	.0298	.0299	-.17	1.013	1.012	.002
5	444.261	.0276	.0276	-.15	1.013	1.012	.002
5	477.594	.0256	.0256	-.14	1.013	1.012	.001
5	510.928	.0239	.0240	-.14	1.013	1.012	.001
5	310.928	.0543	.0545	-.31	1.379	1.375	.004
5	327.594	.0514	.0516	-.27	1.379	1.375	.004
5	344.261	.0488	.0490	-.24	1.379	1.376	.003
5	360.928	.0465	.0466	-.22	1.379	1.376	.003
5	377.594	.0444	.0445	-.20	1.379	1.376	.003
5	410.928	.0407	.0408	-.17	1.379	1.377	.002
5	444.261	.0376	.0376	-.16	1.379	1.377	.002
5	477.594	.0349	.0350	-.16	1.379	1.377	.002
5	510.928	.0326	.0326	-.16	1.379	1.377	.002
5	310.928	.0823	.0826	-.33	2.068	2.062	.007
5	327.594	.0778	.0780	-.29	2.068	2.063	.006
5	344.261	.0738	.0740	-.24	2.068	2.064	.005
5	360.928	.0702	.0703	-.22	2.068	2.064	.005
5	377.594	.0669	.0671	-.23	2.068	2.064	.005
5	410.928	.0613	.0614	-.17	2.068	2.065	.004
5	444.261	.0565	.0566	-.17	2.068	2.065	.003
5	477.594	.0525	.0526	-.16	2.068	2.065	.003
5	510.928	.0490	.0491	-.16	2.068	2.065	.003
5	310.928	.1109	.1112	-.34	2.758	2.749	.009
5	327.594	.1046	.1049	-.29	2.758	2.750	.008
5	344.261	.0991	.0993	-.24	2.758	2.752	.006
5	360.928	.0942	.0944	-.21	2.758	2.752	.006
5	377.594	.0897	.0899	-.19	2.758	2.753	.005
5	410.928	.0820	.0822	-.16	2.758	2.754	.004
5	444.261	.0756	.0757	-.15	2.758	2.754	.004
5	477.594	.0701	.0703	-.16	2.758	2.754	.004
5	510.928	.0654	.0655	-.17	2.758	2.753	.005
5	310.928	.1401	.1405	-.34	3.447	3.436	.011
5	327.594	.1319	.1323	-.29	3.447	3.438	.010
5	344.261	.1248	.1251	-.24	3.447	3.439	.008
5	360.928	.1185	.1187	-.20	3.447	3.441	.007
5	377.594	.1128	.1130	-.17	3.447	3.442	.006
5	410.928	.1030	.1031	-.14	3.447	3.443	.005
5	444.261	.0948	.0950	-.14	3.447	3.443	.005
5	477.594	.0879	.0880	-.15	3.447	3.442	.005
5	510.928	.0819	.0821	-.17	3.447	3.442	.006
5	310.928	.1699	.1705	-.33	4.137	4.124	.013
5	327.594	.1597	.1602	-.29	4.137	4.126	.011
5	344.261	.1509	.1512	-.22	4.137	4.128	.009
5	360.928	.1431	.1433	-.19	4.137	4.129	.007
5	377.594	.1361	.1363	-.15	4.137	4.131	.006
5	410.928	.1241	.1243	-.13	4.137	4.132	.005
5	444.261	.1141	.1143	-.13	4.137	4.132	.005
5	477.594	.1057	.1059	-.14	4.137	4.131	.006
5	510.928	.0985	.0987	-.17	4.137	4.130	.007
5	310.928	.2319	.2326	-.31	5.516	5.500	.015

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
5	327.594	.2170	.2176	-.28	5.516	5.502	.014
5	344.261	.2044	.2048	-.21	5.516	5.505	.011
5	360.928	.1933	.1936	-.17	5.516	5.507	.009
5	377.594	.1835	.1838	-.12	5.516	5.509	.006
5	410.928	.1669	.1671	-.10	5.516	5.511	.005
5	444.261	.1532	.1534	-.10	5.516	5.510	.006
5	477.594	.1417	.1419	-.13	5.516	5.509	.007
5	510.928	.1319	.1321	-.16	5.516	5.507	.009
5	310.928	.2974	.2981	-.21	6.895	6.882	.013
5	327.594	.2768	.2775	-.25	6.895	6.879	.016
5	344.261	.2597	.2602	-.19	6.895	6.883	.012
5	360.928	.2450	.2453	-.16	6.895	6.884	.010
5	377.594	.2321	.2324	-.11	6.895	6.887	.007
5	410.928	.2104	.2106	-.09	6.895	6.889	.006
5	444.261	.1927	.1929	-.09	6.895	6.889	.006
5	477.594	.1780	.1782	-.11	6.895	6.887	.008
5	510.928	.1655	.1657	-.16	6.895	6.884	.011
5	310.928	.3856	.3855	.04	8.618	8.621	-.003
5	327.594	.3555	.3562	-.21	8.618	8.603	.016
5	344.261	.3318	.3323	-.15	8.618	8.607	.011
5	360.928	.3118	.3122	-.12	8.618	8.609	.010
5	377.594	.2945	.2948	-.08	8.618	8.612	.007
5	410.928	.2659	.2661	-.05	8.618	8.614	.004
5	444.261	.2429	.2431	-.06	8.618	8.613	.005
5	477.594	.2239	.2241	-.09	8.618	8.611	.008
5	510.928	.2078	.2082	-.15	8.618	8.606	.013
5	310.928	.4813	.4804	.18	10.342	10.357	-.015
5	327.594	.4396	.4400	-.08	10.342	10.335	.007
5	344.261	.4077	.4080	-.08	10.342	10.335	.007
5	360.928	.3813	.3816	-.07	10.342	10.336	.006
5	377.594	.3590	.3592	-.05	10.342	10.337	.005
5	410.928	.3227	.3228	-.04	10.342	10.339	.003
5	444.261	.2940	.2941	-.05	10.342	10.338	.004
5	477.594	.2704	.2706	-.10	10.342	10.333	.010
5	510.928	.2506	.2510	-.16	10.342	10.326	.016
5	310.928	10.7105	10.6916	.18	13.790	15.837	-2.048
5	327.594	.6286	.6266	.33	13.790	13.824	-.035
5	344.261	.5727	.5720	.12	13.790	13.803	-.014
5	360.928	.5298	.5295	.06	13.790	13.797	-.007
5	377.594	.4950	.4948	.05	13.790	13.795	-.006
5	410.928	.4404	.4403	.02	13.790	13.792	-.003
5	444.261	.3987	.3987	.00	13.790	13.790	-.000
5	477.594	.3652	.3654	-.07	13.790	13.780	.009
5	510.928	.3374	.3379	-.16	13.790	13.768	.021
5	310.928	10.7827	10.7540	.27	20.684	23.980	-3.296
5	327.594	10.0181	9.9973	.21	20.684	22.154	-1.470
5	344.261	.9858	.9759	1.01	20.684	20.827	-.143
5	360.928	.8775	.8729	.52	20.684	20.766	-.082
5	377.594	.8014	.7987	.34	20.684	20.741	-.057
5	410.928	.6942	.6934	.13	20.684	20.707	-.022
5	444.261	.6196	.6191	.09	20.684	20.700	-.016
5	477.594	.5624	.5623	.01	20.684	20.686	-.002
5	510.928	.5161	.5168	-.13	20.684	20.658	.026
5	310.928	10.8301	10.8132	.16	27.579	29.621	-2.042
5	327.594	10.1148	10.0912	.23	27.579	29.415	-1.836
5	344.261	9.1411	9.1101	.34	27.579	28.736	-1.157

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMANN.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
5	360.928	1.3416	1.3244	1.28	27.579	27.796	-.217
5	377.594	1.1733	1.1652	.68	27.579	27.714	-.135
5	410.928	.9779	.9756	.24	27.579	27.633	-.054
5	444.261	.8575	.8559	.18	27.579	27.623	-.044
5	477.594	.7702	.7694	.10	27.579	27.604	-.025
5	510.928	.7018	.7024	-.09	27.579	27.557	.022
5	310.928	10.8854	10.8694	.15	34.474	36.488	-2.015
5	327.594	10.1984	10.1772	.21	34.474	36.255	-1.781
5	344.261	9.2928	9.2802	.14	34.474	35.038	-.564
5	360.928	2.1031	2.0885	.70	34.474	34.557	-.083
5	377.594	1.6584	1.6429	.93	34.474	34.661	-.188
5	410.928	1.3007	1.2960	.36	34.474	34.568	-.094
5	444.261	1.1149	1.1118	.28	34.474	34.554	-.081
5	477.594	.9896	.9876	.21	34.474	34.538	-.064
5	510.928	.8949	.8950	-.01	34.474	34.471	.003
5	310.928	10.9375	10.9231	.13	41.369	43.262	-1.894
5	327.594	10.2757	10.2568	.18	41.369	43.074	-1.705
5	344.261	9.4335	9.4231	.11	41.369	41.911	-.543
5	360.928	8.1712	8.1276	.53	41.369	42.144	-.776
5	377.594	2.3974	2.3843	.55	41.369	41.457	-.088
5	410.928	1.6751	1.6691	.36	41.369	41.470	-.102
5	444.261	1.3948	1.3900	.34	41.369	41.482	-.113
5	477.594	1.2207	1.2177	.25	41.369	41.457	-.089
5	510.928	1.0951	1.0946	.05	41.369	41.386	-.018
5	310.928	11.0317	11.0238	.07	55.158	56.290	-1.132
5	327.594	10.4166	10.4007	.15	55.158	56.797	-1.639
5	344.261	9.6589	9.6582	.01	55.158	55.205	-.047
5	360.928	8.7315	8.6813	.57	55.158	56.892	-1.734
5	377.594	7.0499	6.9273	1.74	55.158	56.191	-1.033
5	410.928	2.6803	2.6719	.31	55.158	55.251	-.093
5	444.261	2.0399	2.0305	.46	55.158	55.343	-.185
5	477.594	1.7237	1.7178	.34	55.158	55.312	-.154
5	510.928	1.5189	1.5161	.19	55.158	55.248	-.090
5	310.928	11.1214	11.1169	.04	68.948	69.646	-.698
5	327.594	10.5380	10.5285	.09	68.948	70.033	-1.085
5	344.261	9.8475	9.8502	-.03	68.948	68.738	.210
5	360.928	9.0630	9.0231	.44	68.948	70.883	-1.935
5	377.594	7.9510	7.9006	.63	68.948	70.119	-1.171
5	410.928	4.2278	4.1832	1.05	68.948	69.313	-.366
5	444.261	2.8165	2.8055	.39	68.948	69.127	-.180
5	477.594	2.2845	2.2754	.40	68.948	69.162	-.214
5	510.928	1.9727	1.9673	.28	68.948	69.109	-.161
5	310.928	11.2244	11.2244	0.00	86.184	86.186	-.002
5	327.594	10.6749	10.6714	.03	86.184	86.638	-.453
5	344.261	10.0496	10.0517	-.02	86.184	85.989	.196
5	360.928	9.3637	9.3357	.30	86.184	87.974	-1.790
5	377.594	8.5092	8.4712	.45	86.184	87.686	-1.502
5	410.928	6.0635	5.9740	1.48	86.184	87.335	-1.150
5	444.261	3.9558	3.9309	.63	86.184	86.556	-.372
5	477.594	3.0576	3.0440	.44	86.184	86.478	-.294
5	510.928	2.5778	2.5676	.40	86.184	86.470	-.285
5	310.928	11.3261	11.3237	.02	103.421	103.853	-.432
5	327.594	10.8049	10.7996	.05	103.421	104.178	-.756
5	344.261	10.2294	10.2242	.05	103.421	103.984	-.563
5	360.928	9.6021	9.5809	.22	103.421	105.086	-1.664
5	377.594	8.8861	8.8466	.45	103.421	105.576	-2.155



Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE, (4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
5	410.928	7.0606	6.9935	.95	103.421	104.986	-1.565
5	444.261	5.0693	5.0199	.97	103.421	104.283	-.861
5	477.594	3.8640	3.8477	.42	103.421	103.775	-.354
5	510.928	3.2585	3.1911	2.07	103.421	105.277	-1.856
5	310.928	11.3999	11.4161	-.14	120.658	117.539	3.119
5	327.594	10.9051	10.9163	-.10	120.658	118.946	1.713
5	344.261	10.3746	10.3758	-.01	120.658	120.514	.144
5	360.928	9.7919	9.7850	.07	120.658	121.294	-.636
5	377.594	9.1524	9.1325	.22	120.658	122.009	-1.351
5	410.928	7.6255	7.6038	.28	120.658	121.414	-.755
5	444.261	5.9152	5.9022	.22	120.658	120.950	-.292
5	477.594	4.6360	4.6133	.49	120.658	121.199	-.540
5	510.928	3.8522	3.8110	1.07	120.658	121.826	-1.168
5	310.928	11.4929	11.5027	-.09	137.895	135.880	2.016
5	327.594	11.0150	11.0236	-.08	137.895	136.459	1.436
5	344.261	10.5206	10.5117	.08	137.895	139.090	-1.195
5	360.928	9.9716	9.9611	.11	137.895	139.006	-1.111
5	377.594	9.3849	9.3661	.20	137.895	139.415	-1.519
5	410.928	8.0717	8.0321	.49	137.895	139.759	-1.864
5	444.261	6.6036	6.5693	.52	137.895	138.931	-1.036
5	477.594	5.3177	5.2897	.53	137.895	138.667	-.772
5	510.928	4.4132	4.3992	.32	137.895	138.323	-.428
5	310.928	11.5573	11.5842	-.23	155.132	149.337	5.795
5	327.594	11.1062	11.1231	-.15	155.132	152.128	3.004
5	344.261	10.6433	10.6351	.08	155.132	156.332	-1.200
5	360.928	10.1141	10.1166	-.02	155.132	154.836	.296
5	377.594	9.5684	9.5649	.04	155.132	155.456	-.324
5	410.928	8.3816	8.3628	.22	155.132	156.233	-1.101
5	444.261	7.1060	7.0740	.45	155.132	156.387	-1.255
5	477.594	5.8807	5.8677	.22	155.132	155.556	-.424
5	510.928	4.9508	4.9368	.28	155.132	155.605	-.473
5	310.928	11.6480	11.6613	-.11	172.369	169.328	3.041
5	327.594	11.2121	11.2160	-.03	172.369	171.622	.747
5	344.261	10.7569	10.7484	.08	172.369	173.725	-1.356
5	360.928	10.2620	10.2563	.06	172.369	173.108	-.739
5	377.594	9.7464	9.7388	.08	172.369	173.169	-.801
5	410.928	8.6576	8.6332	.28	172.369	174.086	-1.717
5	444.261	7.4708	7.4706	.00	172.369	172.380	-.012
5	477.594	6.3814	6.3521	.46	172.369	173.516	-1.147
5	510.928	5.4309	5.4189	.22	172.369	172.823	-.454
5	310.928	11.7344	11.7344	.00	189.606	189.617	-.011
5	327.594	11.3002	11.3032	-.03	189.606	188.992	.613
5	344.261	10.8713	10.8533	.17	189.606	192.695	-3.089
5	360.928	10.3983	10.3836	.14	189.606	191.710	-2.104
5	377.594	9.9084	9.8938	.15	189.606	191.322	-1.716
5	410.928	8.8888	8.8626	.29	189.606	191.741	-2.136
5	444.261	7.8031	7.7947	.11	189.606	190.101	-.495
5	477.594	6.7745	6.7574	.25	189.606	190.404	-.798
5	510.928	5.8649	5.8470	.30	189.606	190.375	-.769
5	310.928	11.7831	11.8040	-.18	206.843	201.588	5.255
5	327.594	11.3883	11.3854	.03	206.843	207.459	-.616
5	344.261	10.9436	10.9511	-.07	206.843	205.479	1.364
5	360.928	10.4923	10.5005	-.08	206.843	205.591	1.251
5	377.594	10.0216	10.0340	-.12	206.843	205.249	1.594
5	410.928	9.0639	9.0624	.02	206.843	206.974	-.131
5	444.261	8.0615	8.0681	-.08	206.843	206.399	.443

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
5	477.594	7.0906	7.1001	-.13	206.843	206.325	.517
5	510.928	6.2230	6.2242	-.02	206.843	206.784	.058
5	310.928	11.9424	11.9342	.07	241.316	243.618	-2.301
5	327.594	11.5326	11.5374	-.04	241.316	240.180	1.136
5	344.261	11.1410	11.1293	.11	241.316	243.741	-2.424
5	360.928	10.7172	10.7100	.07	241.316	242.599	-1.282
5	377.594	10.2812	10.2804	.01	241.316	241.435	-.118
5	410.928	9.3969	9.3995	-.03	241.316	241.018	.298
5	444.261	8.5140	8.5127	.02	241.316	241.432	-.116
5	477.594	7.6525	7.6514	.01	241.316	241.392	-.075
5	510.928	6.8455	6.8497	-.06	241.316	241.051	.265
5	310.928	12.0498	12.0539	-.03	275.790	274.561	1.229
5	327.594	11.6620	11.6753	-.11	275.790	272.319	3.471
5	344.261	11.2819	11.2886	-.06	275.790	274.266	1.525
5	360.928	10.8859	10.8941	-.08	275.790	274.155	1.635
5	377.594	10.4749	10.4930	-.17	275.790	272.674	3.116
5	410.928	9.6748	9.6788	-.04	275.790	275.257	.533
5	444.261	8.8565	8.8676	-.13	275.790	274.607	1.184
5	477.594	8.0765	8.0828	-.08	275.790	275.228	.563
5	510.928	7.3313	7.3450	-.19	275.790	274.728	1.062
5	310.928	12.1457	12.1649	-.16	310.264	304.101	6.163
5	327.594	11.7683	11.8020	-.29	310.264	300.830	9.434
5	344.261	11.4072	11.4332	-.23	310.264	303.836	6.428
5	360.928	11.0621	11.0590	.03	310.264	310.945	-.681
5	377.594	10.6490	10.6805	-.30	310.264	304.188	6.077
5	410.928	9.8918	9.9180	-.27	310.264	306.237	4.027
5	444.261	9.1416	9.1638	-.24	310.264	307.480	2.784
5	477.594	8.4166	8.4362	-.23	310.264	308.176	2.089
5	510.928	7.7251	7.7498	-.32	310.264	307.976	2.288
5	310.928	12.2572	12.2686	-.09	344.738	340.840	3.898
5	327.594	11.9061	11.9191	-.11	344.738	340.782	3.956
5	344.261	11.5514	11.5656	-.12	344.738	340.909	3.829
5	360.928	11.1908	11.2084	-.16	344.738	340.502	4.235
5	377.594	10.8276	10.8487	-.19	344.738	340.221	4.516
5	410.928	10.1139	10.1280	-.14	344.738	342.293	2.445
5	444.261	9.4069	9.4186	-.12	344.738	343.050	1.687
5	477.594	8.7283	8.7357	-.08	344.738	343.829	.909
5	510.928	8.0761	8.0904	-.18	344.738	343.178	1.560
5	310.928	12.4749	12.4574	.14	413.685	420.494	-6.809
5	327.594	12.1499	12.1304	.16	413.685	420.548	-6.862
5	344.261	11.8179	11.8016	.14	413.685	418.821	-5.136
5	360.928	11.5007	11.4717	.25	413.685	421.967	-8.281
5	377.594	11.1447	11.1415	.03	413.685	414.502	-.816
5	410.928	10.4881	10.4847	.03	413.685	414.422	-.736
5	444.261	9.8540	9.8424	.12	413.685	415.792	-2.107
5	477.594	9.2476	9.2256	.24	413.685	417.199	-3.514
5	510.928	8.6504	8.6418	.10	413.685	414.919	-1.233
5	310.928	12.6352	12.6263	.07	482.633	486.457	-3.824
5	327.594	12.3149	12.3172	-.02	482.633	481.714	.919
5	344.261	12.0092	12.0081	.01	482.633	483.006	-.373
5	360.928	11.6962	11.6993	-.03	482.633	481.640	.993
5	377.594	11.3853	11.3914	-.05	482.633	480.832	1.801
5	410.928	10.7778	10.7821	-.04	482.633	481.570	1.063
5	444.261	10.1948	10.1886	.06	482.633	483.975	-1.342
5	477.594	9.6351	9.6191	.17	482.633	485.727	-3.094
5	510.928	9.0952	9.0794	.17	482.633	485.398	-2.765

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
5	310.928	12.7787	12.7793	-.00	551.581	551.309	.271
5	327.594	12.4753	12.4851	-.08	551.581	547.345	4.236
5	344.261	12.1820	12.1919	-.08	551.581	547.673	3.907
5	360.928	11.8832	11.9000	-.14	551.581	545.486	6.094
5	377.594	11.5956	11.6099	-.12	551.581	546.797	4.784
5	410.928	11.0322	11.0378	-.05	551.581	549.959	1.622
5	444.261	10.4816	10.4820	-.00	551.581	551.494	.087
5	477.594	9.9612	9.9487	.13	551.581	554.423	-2.843
5	510.928	9.4627	9.4426	.21	551.581	555.737	-4.156
5	310.928	12.9058	12.9193	-.10	620.528	613.634	6.894
5	327.594	12.6232	12.6377	-.11	620.528	613.704	6.824
5	344.261	12.3438	12.3579	-.11	620.528	614.438	6.091
5	360.928	12.0567	12.0800	-.19	620.528	611.201	9.327
5	377.594	11.7793	11.8044	-.21	620.528	611.207	9.321
5	410.928	11.2496	11.2625	-.11	620.528	616.332	4.196
5	444.261	10.7243	10.7370	-.12	620.528	616.905	3.623
5	477.594	10.2346	10.2327	.02	620.528	621.008	-.480
5	510.928	9.7710	9.7535	.18	620.528	624.706	-4.178
5	310.928	13.0584	13.0485	.08	689.476	695.002	-5.526
5	327.594	12.8054	12.7777	.22	689.476	703.784	-14.309
5	344.261	12.5179	12.5092	.07	689.476	693.618	-4.142
5	360.928	12.2479	12.2432	.04	689.476	691.585	-2.109
5	377.594	11.9696	11.9799	-.09	689.476	685.244	4.232
5	410.928	11.4707	11.4631	.07	689.476	692.215	-2.740
5	444.261	10.9750	10.9627	.11	689.476	693.447	-3.971
5	477.594	10.5055	10.4825	.22	689.476	696.237	-6.761
5	510.928	10.0543	10.0256	.29	689.476	697.281	-7.805

NP = 306, DNRMSPT = .320, PMEANDIF = 1.279



Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE, (4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
17	322.594	10.2592	10.2461	.13	20.774	21.861	-1.087
17	324.817	10.2567	10.2415	.15	29.110	30.409	-1.299
17	327.594	10.2537	10.2378	.16	39.672	41.088	-1.415
17	318.706	10.4385	10.4259	.12	20.864	22.050	-1.187
17	323.150	10.4335	10.4190	.14	38.638	40.078	-1.439
17	327.594	10.4286	10.4140	.14	56.523	58.038	-1.515
17	313.706	10.6195	10.6083	.11	17.382	18.545	-1.163
17	320.928	10.6106	10.5987	.11	48.022	49.358	-1.337
17	327.594	10.6029	10.5916	.11	76.311	77.676	-1.365
17	309.261	10.8163	10.8077	.08	19.140	20.156	-1.016
17	314.817	10.8095	10.7996	.09	44.064	45.294	-1.230
17	320.372	10.8025	10.7935	.08	69.085	70.271	-1.185
17	325.928	10.7959	10.7868	.08	93.913	95.177	-1.264
17	304.261	10.9973	10.9869	.09	17.127	18.473	-1.347
17	313.150	10.9857	10.9763	.09	59.412	60.738	-1.326
17	322.039	10.9746	10.9672	.07	101.567	102.699	-1.132
17	298.150	11.1828	11.1731	.09	11.238	12.606	-1.367
17	305.372	11.1728	11.1648	.07	47.615	48.830	-1.214
17	313.706	11.1619	11.1557	.06	89.370	90.385	-1.015
17	322.039	11.1510	11.1470	.04	130.890	131.594	-.704
17	293.150	11.3642	11.3553	.08	11.445	12.842	-1.397
17	298.150	11.3570	11.3499	.06	38.100	39.253	-1.152
17	308.150	11.3431	11.3398	.03	91.162	91.758	-.595
17	316.483	11.3318	11.3316	.00	135.096	135.124	-.028
17	298.150	11.5322	11.5278	.04	69.272	70.101	-.830
17	299.817	11.5465	11.5602	-.12	85.157	82.501	2.656
17	303.150	11.5252	11.5228	.02	97.195	97.678	-.483
17	308.706	11.5173	11.5173	-.00	128.125	128.120	.005
17	282.594	11.7243	11.7147	.08	11.625	13.449	-1.824
17	284.261	11.7216	11.7127	.08	21.484	23.182	-1.698
17	291.483	11.7098	11.7061	.03	64.383	65.130	-.747
17	298.150	11.7003	11.6994	.01	103.635	103.815	-.180
17	303.150	11.6930	11.6937	-.01	132.765	132.618	.148
17	277.594	11.8799	11.8701	.08	10.563	12.547	-1.984
17	285.928	11.8663	11.8628	.03	62.501	63.254	-.753
17	291.483	11.8572	11.8576	-.00	96.864	96.772	.093
17	298.150	11.8472	11.8509	-.03	137.792	136.910	.882
17	280.372	12.0377	12.0385	-.01	65.769	65.591	.178
17	285.928	12.0287	12.0326	-.03	101.780	100.821	.959
17	291.483	12.0198	12.0277	-.07	137.881	135.871	2.011

NP = 40, DNRMSPT = .083, PMEANDIF = 1.080

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE, (4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAK	CALCD	P,DIF
24	288.263	11.5184	11.5159	.02	9.950	10.370	-.420
24	288.981	11.5182	11.5158	.02	14.087	14.487	-.400
24	291.393	11.5180	11.5156	.02	27.986	28.397	-.411
24	293.489	11.5175	11.5155	.02	40.067	40.431	-.364
24	296.555	11.5171	11.5154	.01	57.744	58.054	-.310
24	300.104	11.5164	11.5154	.01	78.212	78.400	-.188
24	303.696	11.5159	11.5155	.00	98.936	99.010	-.074
24	307.131	11.5152	11.5158	-.00	118.760	118.648	.112
24	310.771	11.5148	11.5162	-.01	139.780	139.485	.295
24	314.179	11.5141	11.5167	-.02	159.460	158.918	.542
24	317.799	11.5137	11.5173	-.03	180.380	179.592	.788
24	321.470	11.5130	11.5179	-.04	201.600	200.484	1.116
24	277.973	11.8368	11.8328	.03	5.517	6.303	-.786
24	278.268	11.8368	11.8330	.03	7.419	8.181	-.763
24	280.501	11.8363	11.8339	.02	21.805	22.305	-.500
24	283.701	11.8359	11.8351	.01	42.392	42.563	-.171
24	288.949	11.8348	11.8367	-.02	76.082	75.651	.431
24	294.597	11.8339	11.8382	-.04	112.241	111.255	.986
24	299.983	11.8329	11.8392	-.05	146.620	145.131	1.489
24	308.342	11.8316	11.8402	-.07	199.780	197.589	2.191
24	319.913	11.8295	11.8408	-.09	273.000	269.910	3.090
24	267.752	12.1552	12.1456	.08	4.041	6.258	-2.217
24	268.361	12.1550	12.1459	.07	8.370	10.473	-2.103
24	269.318	12.1550	12.1464	.07	15.169	17.178	-2.009
24	270.036	12.1547	12.1467	.07	20.268	22.154	-1.886
24	271.190	12.1545	12.1473	.06	28.457	30.180	-1.723
24	273.224	12.1541	12.1482	.05	42.877	44.306	-1.429
24	275.321	12.1538	12.1490	.04	57.722	58.916	-1.194
24	277.531	12.1534	12.1498	.03	73.345	74.248	-.903
24	280.521	12.1527	12.1507	.02	94.447	94.954	-.507
24	283.740	12.1522	12.1516	.01	117.120	117.291	-.171
24	287.984	12.1513	12.1525	-.01	146.930	146.618	.312
24	293.573	12.1504	12.1533	-.02	186.070	185.248	.822
24	299.091	12.1493	12.1538	-.04	224.570	223.243	1.327
24	304.757	12.1482	12.1539	-.05	263.950	262.184	1.766
24	312.701	12.1468	12.1536	-.06	318.910	316.717	2.193
24	323.740	12.1448	12.1523	-.06	394.790	392.192	2.598
24	258.574	12.4459	12.4317	.11	7.550	11.314	-3.764
24	260.283	12.4457	12.4330	.10	20.907	24.328	-3.421
24	264.687	12.4448	12.4358	.07	55.231	57.739	-2.508
24	269.204	12.4439	12.4381	.05	90.289	91.954	-1.665
24	273.221	12.4430	12.4397	.03	121.340	122.303	-.963
24	278.846	12.4418	12.4414	.00	164.630	164.762	-.132
24	283.771	12.4409	12.4423	-.01	202.350	201.890	.460
24	288.215	12.4400	12.4428	-.02	236.230	235.307	.923
24	293.359	12.4391	12.4429	-.03	275.270	273.965	1.305
24	297.819	12.4382	12.4427	-.04	308.960	307.384	1.576
24	300.501	12.4375	12.4424	-.04	329.150	327.404	1.746
24	305.386	12.4366	12.4417	-.04	365.800	363.937	1.863
24	310.827	12.4355	12.4405	-.04	406.410	404.504	1.906
24	250.200	12.6886	12.6701	.15	7.767	13.233	-5.466
24	251.067	12.6883	12.6710	.14	15.143	20.310	-5.167
24	251.924	12.6881	12.6719	.13	22.426	27.301	-4.875
24	253.890	12.6877	12.6737	.11	39.104	43.352	-4.248
24	258.311	12.6867	12.6773	.07	76.451	79.435	-2.984

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
24	263.206	12.6856	12.6804	.04	117.550	119.275	-1.725
24	263.239	12.6856	12.6804	.04	117.830	119.546	-1.716
24	268.014	12.6847	12.6825	.02	157.660	158.402	-.742
24	276.292	12.6829	12.6846	-.01	226.120	225.517	.603
24	283.484	12.6813	12.6848	-.03	284.990	283.649	1.341
24	294.455	12.6790	12.6830	-.03	373.690	372.080	1.610
24	247.621	12.7416	12.7244	.14	2.571	7.758	-5.187
24	247.734	12.7416	12.7245	.13	3.546	8.704	-5.159
24	248.490	12.7416	12.7253	.13	10.065	15.038	-4.973
24	248.673	12.7414	12.7254	.13	11.642	16.501	-4.859
24	249.310	12.7414	12.7260	.12	17.130	21.836	-4.706
24	250.333	12.7412	12.7269	.11	25.934	30.332	-4.398
24	251.088	12.7409	12.7275	.11	32.424	36.582	-4.158
24	252.974	12.7405	12.7290	.09	48.612	52.219	-3.607
24	255.995	12.7398	12.7312	.07	74.466	77.259	-2.793
24	258.548	12.7394	12.7327	.05	96.241	98.436	-2.195
24	263.440	12.7382	12.7351	.02	137.810	138.872	-1.062
24	268.197	12.7373	12.7366	.01	177.930	178.187	-.257
24	273.360	12.7362	12.7376	-.01	221.250	220.725	.525
24	278.376	12.7350	12.7380	-.02	263.070	261.959	1.111
24	283.231	12.7339	12.7378	-.03	303.300	301.779	1.521
24	288.691	12.7328	12.7371	-.03	348.260	346.527	1.733
24	293.107	12.7319	12.7361	-.03	384.390	382.656	1.734
24	297.847	12.7310	12.7346	-.03	422.950	421.397	1.553
24	247.820	12.7731	12.7613	.09	15.453	19.117	-3.664
24	248.646	12.7731	12.7620	.09	22.614	26.102	-3.488
24	250.345	12.7727	12.7632	.07	37.322	40.322	-3.000
24	252.131	12.7722	12.7644	.06	52.754	55.267	-2.513
24	254.247	12.7718	12.7657	.05	70.999	72.986	-1.987
24	256.785	12.7713	12.7671	.03	92.827	94.250	-1.423
24	259.619	12.7706	12.7683	.02	117.130	117.913	-.783
24	262.510	12.7700	12.7694	.00	141.840	142.029	-.189
24	265.495	12.7693	12.7703	-.01	167.280	166.908	.372
24	268.171	12.7688	12.7710	-.02	190.010	189.244	.766
24	271.181	12.7682	12.7715	-.03	215.500	214.279	1.221
24	276.240	12.7670	12.7719	-.04	258.150	256.296	1.854
24	281.440	12.7659	12.7718	-.05	301.730	299.410	2.320
24	286.945	12.7648	12.7711	-.05	347.600	344.986	2.614
24	286.968	12.7648	12.7711	-.05	347.790	345.179	2.611
24	291.062	12.7638	12.7704	-.05	381.720	378.985	2.735
24	296.653	12.7627	12.7689	-.05	427.790	425.112	2.678
24	235.542	13.0727	13.0591	.10	4.570	9.317	-4.747
24	236.163	13.0725	13.0598	.10	10.563	15.003	-4.440
24	237.116	13.0723	13.0609	.09	19.745	23.770	-4.025
24	237.986	13.0720	13.0618	.08	28.112	31.763	-3.651
24	239.626	13.0718	13.0634	.06	43.844	46.895	-3.051
24	242.193	13.0711	13.0655	.04	68.363	70.445	-2.082
24	245.592	13.0704	13.0677	.02	100.630	101.675	-1.045
24	249.203	13.0695	13.0693	.00	134.660	134.739	-.079
24	252.921	13.0686	13.0704	-.01	169.440	168.744	.696
24	256.518	13.0677	13.0708	-.02	202.830	201.584	1.246
24	260.718	13.0668	13.0705	-.03	241.490	239.933	1.557
24	264.442	13.0659	13.0697	-.03	275.490	273.841	1.649
24	267.990	13.0650	13.0685	-.03	307.630	306.082	1.548
24	232.965	13.1686	13.1475	.16	11.792	19.533	-7.741
24	234.603	13.1684	13.1489	.15	27.885	35.118	-7.233



Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
24	234.672	13.1684	13.1490	.15	28.562	35.778	-7.216
24	236.343	13.1680	13.1503	.13	44.938	51.585	-6.647
24	238.154	13.1675	13.1516	.12	62.641	68.719	-6.078
24	239.793	13.1670	13.1526	.11	78.622	84.198	-5.576
24	242.380	13.1664	13.1540	.09	103.770	108.625	-4.855
24	245.001	13.1659	13.1552	.08	129.150	133.442	-4.292
24	249.556	13.1648	13.1567	.06	173.020	176.374	-3.354
24	254.065	13.1636	13.1575	.05	216.150	218.792	-2.642
24	258.913	13.1625	13.1577	.04	262.210	264.353	-2.143
24	263.566	13.1614	13.1573	.03	306.100	307.981	-1.881
24	268.618	13.1602	13.1562	.03	353.390	355.303	-1.913
24	273.058	13.1591	13.1548	.03	394.660	396.751	-2.091
24	226.866	13.3151	13.3040	.08	11.092	15.410	-4.318
24	228.670	13.3147	13.3056	.07	29.726	33.311	-3.585
24	230.980	13.3142	13.3074	.05	53.514	56.266	-2.752
24	234.058	13.3133	13.3094	.03	85.084	86.699	-1.615
24	237.362	13.3129	13.3111	.01	118.810	119.545	-.735
24	242.108	13.3115	13.3129	-.01	166.960	166.356	.604
24	247.394	13.3101	13.3140	-.03	220.190	218.456	1.734
24	250.151	13.3095	13.3142	-.04	247.790	245.601	2.189
24	254.663	13.3083	13.3141	-.04	292.690	289.951	2.739
24	258.294	13.3074	13.3136	-.05	328.600	325.586	3.014
24	261.963	13.3061	13.3128	-.05	364.690	361.321	3.369
24	265.574	13.3056	13.3118	-.05	400.010	396.879	3.131
24	218.855	13.5163	13.5006	.12	7.779	14.399	-6.620
24	219.585	13.5160	13.5012	.11	15.821	22.107	-6.286
24	221.230	13.5156	13.5026	.10	33.908	39.494	-5.586
24	223.680	13.5151	13.5044	.08	60.763	65.466	-4.703
24	226.125	13.5145	13.5060	.06	87.463	91.263	-3.800
24	227.750	13.5140	13.5068	.05	105.150	108.394	-3.244
24	228.861	13.5138	13.5074	.05	117.220	120.138	-2.918
24	229.601	13.5136	13.5077	.04	125.250	127.923	-2.673
24	231.940	13.5129	13.5087	.03	150.560	152.531	-1.971
24	234.664	13.5122	13.5095	.02	179.930	181.214	-1.284
24	238.083	13.5113	13.5102	.01	216.610	217.146	-.536
24	242.385	13.5102	13.5105	-.00	262.480	262.293	.187
24	246.702	13.5090	13.5103	-.01	308.200	307.522	.678
24	251.325	13.5079	13.5096	-.01	356.820	355.911	.909
24	256.596	13.5065	13.5081	-.01	411.820	410.937	.883
24	211.641	13.6959	13.6738	.16	4.075	14.055	-9.981
24	212.694	13.6957	13.6747	.15	16.320	25.887	-9.567
24	214.101	13.6952	13.6758	.14	32.652	41.619	-8.967
24	217.902	13.6941	13.6783	.12	76.602	84.119	-7.517
24	222.089	13.6929	13.6803	.09	124.730	130.918	-6.188
24	225.450	13.6920	13.6815	.08	163.140	168.432	-5.292
24	230.231	13.6907	13.6831	.06	217.740	221.674	-3.934
24	235.520	13.6893	13.6829	.05	277.060	280.530	-3.470
24	241.297	13.6877	13.6824	.04	341.620	344.621	-3.001
24	244.776	13.6868	13.6817	.04	380.220	383.171	-2.951
24	247.542	13.6859	13.6809	.04	410.760	413.673	-2.913
24	205.755	13.8569	13.8486	.06	17.649	21.716	-4.067
24	207.297	13.8564	13.8497	.05	36.606	39.920	-3.314
24	209.435	13.8560	13.8512	.03	62.801	65.230	-2.429
24	212.526	13.8551	13.8528	.02	100.490	101.662	-1.172
24	216.578	13.8537	13.8543	-.00	149.560	149.263	.297
24	220.157	13.8528	13.8550	-.02	192.590	191.399	1.191

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE, (4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
24	225.334	13.8512	13.8552	-.03	254.320	252.094	2.226
24	227.547	13.8508	13.8549	-.03	280.520	278.127	2.393
24	230.819	13.8496	13.8543	-.03	319.060	316.310	2.750
24	235.224	13.8485	13.8530	-.03	370.550	367.860	2.690
24	237.320	13.8478	13.8521	-.03	394.890	392.271	2.619
24	199.157	13.9909	13.9853	.04	5.378	8.234	-2.856
24	200.472	13.9905	13.9864	.03	22.353	24.438	-2.085
24	202.817	13.9898	13.9879	.01	52.383	53.379	-.996
24	206.391	13.9886	13.9898	-.01	97.993	97.388	.605
24	210.980	13.9873	13.9911	-.03	156.020	153.857	2.163
24	216.347	13.9857	13.9917	-.04	223.260	219.771	3.489
24	216.464	13.9855	13.9910	-.04	224.300	221.095	3.205
24	221.205	13.9841	13.9859	-.01	280.310	279.220	1.090
24	225.885	13.9827	13.9891	-.05	340.430	336.475	3.955
24	231.094	13.9812	13.9868	-.04	403.660	400.023	3.637
24	192.615	14.1549	14.1513	.03	9.162	11.105	-1.943
24	193.111	14.1549	14.1517	.02	15.904	17.659	-1.755
24	195.904	14.1540	14.1534	.00	53.735	54.045	-.310
24	197.140	14.1535	14.1540	-.00	70.407	70.105	.302
24	199.390	14.1528	14.1550	-.02	100.650	99.402	1.248
24	202.609	14.1517	14.1559	-.03	143.660	141.178	2.482
24	205.926	14.1508	14.1563	-.04	187.680	184.324	3.356
24	209.500	14.1496	14.1563	-.05	234.770	230.655	4.115
24	213.137	14.1485	14.1557	-.05	282.320	277.744	4.576
24	215.014	14.1478	14.1552	-.05	306.720	301.956	4.764
24	217.285	14.1472	14.1545	-.05	336.100	331.315	4.785
24	220.119	14.1462	14.1533	-.05	372.570	367.875	4.695
24	184.715	14.3397	14.3358	.03	6.163	8.475	-2.312
24	185.973	14.3392	14.3365	.02	24.300	25.918	-1.618
24	187.723	14.3388	14.3267	.08	42.992	50.274	-7.282
24	189.954	14.3379	14.3383	-.00	81.375	81.102	.273
24	194.865	14.3363	14.3394	-.02	151.110	149.115	1.995
24	198.151	14.3351	14.3395	-.03	197.350	194.501	2.849
24	204.051	14.3331	14.3386	-.04	279.550	275.827	3.723
24	208.548	14.3317	14.3370	-.04	341.470	337.807	3.663
24	213.736	14.3299	14.3343	-.03	412.140	408.984	3.156
24	177.351	14.5243	14.5227	.01	13.550	14.535	-.985
24	179.819	14.5234	14.5238	-.00	51.280	51.008	.272
24	181.543	14.5227	14.5243	-.01	77.509	76.433	1.076
24	183.330	14.5222	14.5247	-.02	104.590	102.935	1.655
24	187.888	14.5206	14.5249	-.03	173.130	170.162	2.968
24	190.854	14.5195	14.5246	-.04	217.350	213.768	3.582
24	194.795	14.5182	14.5235	-.04	275.610	271.722	3.888
24	198.915	14.5168	14.5217	-.03	335.930	332.245	3.685
24	201.433	14.5159	14.5203	-.03	372.500	369.123	3.377
24	204.618	14.5148	14.5183	-.02	418.440	415.716	2.724
24	166.227	14.7764	14.7745	.01	7.033	8.424	-1.391
24	167.461	14.7760	14.7749	.01	27.642	28.385	-.743
24	168.747	14.7755	14.7753	.00	49.045	49.192	-.147
24	171.053	14.7746	14.7758	-.01	87.235	86.406	.829
24	174.434	14.7733	14.7758	-.02	142.790	140.880	1.910
24	178.373	14.7717	14.7751	-.02	206.850	204.237	2.613
24	182.557	14.7701	14.7734	-.02	274.110	271.484	2.626
24	187.796	14.7683	14.7702	-.01	357.200	355.643	1.557
24	189.817	14.7676	14.7686	-.01	388.920	388.070	.850

NP = 222, DNRMSPT = .060, PMEANDIF = 2.494

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
26	373.150	7.2567	7.4795	-3.07	53.937	51.540	2.397
26	383.150	7.2567	7.3794	-1.69	68.647	66.809	1.837
26	393.150	7.2567	7.3627	-1.46	84.337	82.251	2.086
26	403.150	7.2567	7.3476	-1.25	100.028	97.815	2.213
26	413.150	7.2567	7.3341	-1.07	115.718	113.471	2.247
26	363.150	7.7102	7.9057	-2.54	42.169	39.807	2.361
26	373.150	7.7102	7.8588	-1.93	59.821	57.206	2.615
26	383.150	7.7102	7.8248	-1.49	77.473	74.835	2.637
26	393.150	7.7102	7.8315	-1.57	96.105	92.614	3.492
26	403.150	7.7102	7.7776	-.87	112.776	110.503	2.274
26	413.150	7.7102	7.7845	-.96	131.409	128.479	2.930
26	363.150	8.1638	8.2843	-1.48	49.033	46.476	2.558
26	373.150	8.1638	8.2346	-.87	68.647	66.711	1.936
26	383.150	8.1638	8.2268	-.77	89.241	87.107	2.133
26	393.150	8.1638	8.2423	-.96	110.815	107.620	3.195
26	403.150	8.1638	8.2316	-.83	131.409	128.223	3.186
26	413.150	8.1638	8.2220	-.71	152.003	148.898	3.105
26	353.150	8.6173	8.6318	-.17	35.304	34.935	.369
26	363.150	8.6173	8.6341	-.20	58.840	58.278	.562
26	373.150	8.6173	8.6321	-.17	82.376	81.768	.608
26	383.150	8.6173	8.6486	-.36	106.892	105.364	1.529
26	393.150	8.6173	8.6592	-.49	131.409	129.038	2.371
26	403.150	8.6173	8.6513	-.39	154.945	152.775	2.170
26	413.150	8.6173	8.6579	-.47	179.462	176.561	2.901
26	353.150	9.0709	9.0668	.05	50.014	50.190	-.176
26	363.150	9.0709	9.0928	-.24	78.453	77.307	1.146
26	373.150	9.0709	9.0940	-.26	105.912	104.499	1.413
26	383.150	9.0709	9.0942	-.26	133.370	131.746	1.624
26	393.150	9.0709	9.0939	-.25	160.829	159.035	1.794
26	403.150	9.0709	9.0932	-.25	188.288	186.355	1.933
26	413.150	9.0709	9.0925	-.24	215.746	213.696	2.050
26	343.150	9.2976	9.2830	.16	31.381	32.028	-.647
26	353.150	9.2976	9.2914	.07	60.801	61.134	-.333
26	363.150	9.2976	9.3117	-.15	91.202	90.306	.896
26	373.150	9.2976	9.3127	-.16	120.622	119.524	1.097
26	383.150	9.2976	9.3131	-.17	150.042	148.776	1.266
26	393.150	9.2976	9.3132	-.17	179.462	178.049	1.412
26	403.150	9.2976	9.3131	-.17	208.882	207.338	1.543
26	413.150	9.2976	9.3219	-.26	239.282	236.635	2.647
26	343.150	9.5244	9.5017	.24	42.169	43.440	-1.272
26	353.150	9.5244	9.5211	.04	74.531	74.754	-.224
26	363.150	9.5244	9.5219	.03	105.912	106.100	-.188
26	373.150	9.5244	9.5224	.02	137.293	137.467	-.174
26	383.150	9.5244	9.5328	-.09	169.655	168.846	.809
26	393.150	9.5244	9.5321	-.08	201.036	200.229	.807
26	403.150	9.5244	9.5314	-.07	232.418	231.612	.806
26	413.150	9.5244	9.5388	-.15	264.780	262.988	1.792
26	343.150	9.7512	9.7521	-.01	57.859	57.798	.061
26	353.150	9.7512	9.7483	.03	91.202	91.439	-.237
26	363.150	9.7512	9.7453	.06	124.544	125.084	-.539
26	373.150	9.7512	9.7526	-.01	158.868	158.727	.141
26	383.150	9.7512	9.7586	-.08	193.191	192.362	.829
26	393.150	9.7512	9.7557	-.05	226.534	225.985	.549
26	403.150	9.7512	9.7533	-.02	259.876	259.591	.286
26	413.150	9.7512	9.7652	-.14	295.180	293.176	2.004



Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
26	333.150	9.9780	9.9755	.02	39.227	39.407	-.180
26	343.150	9.9780	9.9779	.00	75.511	75.517	-.006
26	353.150	9.9780	9.9798	-.02	111.796	111.612	.183
26	363.150	9.9780	9.9725	.05	147.100	147.688	-.589
26	373.150	9.9780	9.9750	.03	183.384	183.742	-.357
26	383.150	9.9780	9.9772	.01	219.669	219.768	-.100
26	393.150	9.9780	9.9723	.06	254.973	255.766	-.793
26	403.150	9.9780	9.9683	.10	290.277	291.731	-1.455
26	413.150	9.9780	9.9712	.07	326.561	327.662	-1.101
26	333.150	10.2047	10.1889	.15	56.879	58.327	-1.449
26	343.150	10.2047	10.1956	.09	96.105	97.053	-.948
26	353.150	10.2047	10.1927	.12	134.351	135.739	-1.388
26	363.150	10.2047	10.1906	.14	172.597	174.386	-1.789
26	373.150	10.2047	10.1892	.15	210.843	212.991	-2.148
26	383.150	10.2047	10.1949	.10	250.070	251.552	-1.482
26	393.150	10.2047	10.1878	.17	287.335	290.068	-2.733
26	403.150	10.2047	10.1990	.06	327.542	328.536	-.994
26	413.150	10.2047	10.1931	.11	364.807	366.957	-2.149
26	323.150	10.4315	10.4249	.06	39.227	39.875	-.648
26	333.150	10.4315	10.4313	.00	81.395	81.420	-.024
26	343.150	10.4315	10.4210	.10	121.602	122.903	-1.301
26	353.150	10.4315	10.4202	.11	162.790	164.328	-1.538
26	363.150	10.4315	10.4266	.05	204.959	205.694	-.735
26	373.150	10.4315	10.4201	.11	245.166	247.002	-1.835
26	383.150	10.4315	10.4091	.21	284.393	288.249	-3.856
26	393.150	10.4315	10.4213	.10	327.542	329.436	-1.894
26	403.150	10.4315	10.4172	.14	367.749	370.561	-2.812
26	413.150	10.4315	10.4233	.08	409.918	411.624	-1.706
26	313.150	10.6583	10.6530	.05	19.613	20.178	-.565
26	323.150	10.6583	10.6500	.08	63.743	64.740	-.997
26	333.150	10.6583	10.6408	.16	106.892	109.219	-2.326
26	343.150	10.6583	10.6472	.10	152.003	153.617	-1.614
26	353.150	10.6583	10.6408	.16	195.152	197.939	-2.787
26	363.150	10.6583	10.6414	.16	239.282	242.186	-2.904
26	373.150	10.6583	10.6424	.15	283.412	286.357	-2.945
26	383.150	10.6583	10.6436	.14	327.542	330.454	-2.911
26	393.150	10.6583	10.6403	.17	370.691	374.475	-3.784
26	403.150	10.6583	10.6422	.15	414.821	418.421	-3.600
26	413.150	10.6583	10.6483	.09	459.932	462.292	-2.360
26	313.150	10.8850	10.8624	.21	44.130	47.055	-2.925
26	323.150	10.8850	10.8673	.16	92.183	94.735	-2.552
26	333.150	10.8850	10.8656	.18	139.254	142.315	-3.061
26	343.150	10.8850	10.8648	.19	186.326	189.800	-3.473
26	353.150	10.8850	10.8699	.14	234.379	237.191	-2.812
26	363.150	10.8850	10.8698	.14	281.451	284.492	-3.041
26	373.150	10.8850	10.8701	.14	328.523	331.703	-3.180
26	383.150	10.8850	10.8708	.13	375.595	378.824	-3.230
26	393.150	10.8850	10.8800	.05	424.628	425.857	-1.229
26	403.150	10.8850	10.8769	.08	470.719	472.800	-2.081
26	413.150	10.8850	10.8781	.06	517.791	519.656	-1.864
26	303.150	11.1118	11.0840	.25	24.517	28.410	-3.894
26	313.150	11.1118	11.0923	.18	76.492	79.514	-3.022
26	323.150	11.1118	11.0999	.11	128.467	130.496	-2.029
26	333.150	11.1118	11.1016	.09	179.462	181.363	-1.902
26	343.150	11.1118	11.1035	.07	230.456	232.121	-1.664
26	353.150	11.1118	11.1057	.06	281.451	282.771	-1.320

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
26	363.150	11.1118	11.1038	.07	331.465	333.316	-1.851
26	373.150	11.1118	11.1065	.05	382.459	383.756	-1.297
26	383.150	11.1118	11.1056	.06	432.473	434.094	-1.621
26	393.150	11.1118	11.1015	.09	481.507	484.329	-2.823
26	403.150	11.1118	11.1050	.06	532.501	534.463	-1.962
26	413.150	11.1118	11.1053	.06	582.515	584.495	-1.980
26	303.150	11.3386	11.3160	.20	59.821	63.623	-3.802
26	313.150	11.3386	11.3196	.17	114.738	118.243	-3.505
26	323.150	11.3386	11.3233	.14	169.655	172.731	-3.076
26	333.150	11.3386	11.3270	.10	224.572	227.091	-2.519
26	343.150	11.3386	11.3265	.11	278.509	281.328	-2.819
26	353.150	11.3386	11.3265	.11	332.445	335.444	-2.998
26	363.150	11.3386	11.3270	.10	386.382	389.440	-3.058
26	373.150	11.3386	11.3314	.06	441.299	443.320	-2.021
26	383.150	11.3386	11.3290	.08	494.255	497.083	-2.828
26	393.150	11.3386	11.3304	.07	548.192	550.730	-2.538
26	403.150	11.3386	11.3290	.08	601.148	604.263	-3.115
26	413.150	11.3386	11.3252	.12	653.123	657.681	-4.558
26	293.150	11.4520	11.4246	.24	22.555	27.126	-4.571
26	303.150	11.4520	11.4285	.20	79.434	83.734	-4.300
26	313.150	11.4520	11.4375	.13	137.293	140.196	-2.903
26	323.150	11.4520	11.4412	.09	194.172	196.520	-2.348
26	333.150	11.4520	11.4407	.10	250.070	252.710	-2.641
26	343.150	11.4520	11.4408	.10	305.967	308.770	-2.803
26	353.150	11.4520	11.4450	.06	362.846	364.703	-1.857
26	363.150	11.4520	11.4422	.08	417.763	420.511	-2.748
26	373.150	11.4520	11.4435	.07	473.661	476.194	-2.533
26	383.150	11.4520	11.4450	.06	529.559	531.754	-2.195
26	393.150	11.4520	11.4438	.07	584.476	587.192	-2.716
26	403.150	11.4520	11.4430	.08	639.394	642.509	-3.115
26	413.150	11.4520	11.4372	.13	692.349	697.705	-5.355
26	293.150	11.5654	11.5436	.19	43.149	47.136	-3.986
26	303.150	11.5654	11.5520	.12	102.970	105.649	-2.679
26	313.150	11.5654	11.5552	.09	161.810	164.012	-2.202
26	323.150	11.5654	11.5586	.06	220.650	222.232	-1.582
26	333.150	11.5654	11.5582	.06	278.509	280.312	-1.803
26	343.150	11.5654	11.5547	.09	335.387	338.256	-2.868
26	353.150	11.5654	11.5589	.06	394.227	396.066	-1.838
26	363.150	11.5654	11.5599	.05	452.087	453.743	-1.657
26	373.150	11.5654	11.5581	.06	508.965	511.291	-2.325
26	383.150	11.5654	11.5598	.05	566.824	568.708	-1.884
26	393.150	11.5654	11.5589	.06	623.703	625.997	-2.294
26	403.150	11.5654	11.5557	.08	679.601	683.157	-3.557
26	413.150	11.5654	11.5557	.08	736.479	740.191	-3.712
26	293.150	11.6787	11.6574	.18	64.724	68.992	-4.269
26	303.150	11.6787	11.6651	.12	126.506	129.474	-2.969
26	313.150	11.6787	11.6682	.09	187.307	189.802	-2.495
26	323.150	11.6787	11.6714	.06	248.108	249.980	-1.872
26	333.150	11.6787	11.6747	.03	308.909	310.013	-1.103
26	343.150	11.6787	11.6713	.06	367.749	369.903	-2.154
26	353.150	11.6787	11.6751	.03	428.551	429.653	-1.103
26	363.150	11.6787	11.6730	.05	487.391	489.265	-1.874
26	373.150	11.6787	11.6743	.04	547.211	548.739	-1.528
26	383.150	11.6787	11.6758	.02	607.032	608.077	-1.045
26	393.150	11.6787	11.6750	.03	665.872	667.279	-1.408
26	403.150	11.6787	11.6721	.06	723.731	726.347	-2.616

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE, (4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	O,PCT	P,BAR	CALCD	P,DIF
26	413.150	11.6787	11.6697	.08	781.590	785.281	-3.691
26	283.150	11.7921	11.7689	.20	25.497	30.124	-4.627
26	293.150	11.7921	11.7757	.14	89.241	92.808	-3.567
26	303.150	11.7921	11.7781	.12	152.003	155.325	-3.322
26	313.150	11.7921	11.7845	.06	215.746	217.683	-1.936
26	323.150	11.7921	11.7871	.04	278.509	279.886	-1.377
26	333.150	11.7921	11.7865	.05	340.291	341.938	-1.647
26	343.150	11.7921	11.7864	.05	402.073	403.841	-1.769
26	353.150	11.7921	11.7898	.02	464.835	465.598	-.763
26	363.150	11.7921	11.7904	.01	526.617	527.209	-.592
26	373.150	11.7921	11.7887	.03	587.418	588.677	-1.258
26	383.150	11.7921	11.7900	.02	649.200	650.001	-.801
26	393.150	11.7921	11.7867	.05	709.021	711.183	-2.162
26	403.150	11.7921	11.7864	.05	769.822	772.224	-2.402
26	413.150	11.7921	11.7841	.07	829.643	833.124	-3.481
26	283.150	11.9055	11.8967	.07	51.975	53.906	-1.931
26	293.150	11.9055	11.8971	.07	116.699	118.699	-2.000
26	303.150	11.9055	11.9058	-.00	183.384	183.321	.063
26	313.150	11.9055	11.9067	-.01	248.108	247.779	.329
26	323.150	11.9055	11.9081	-.02	312.832	312.078	.754
26	333.150	11.9055	11.9067	-.01	376.575	376.219	.356
26	343.150	11.9055	11.9088	-.03	441.299	440.205	1.094
26	353.150	11.9055	11.9112	-.05	506.023	504.039	1.985
26	363.150	11.9055	11.9111	-.05	569.766	567.720	2.047
26	373.150	11.9055	11.9113	-.05	633.510	631.250	2.260
26	383.150	11.9055	11.9096	-.03	696.272	694.630	1.642
26	393.150	11.9055	11.9083	-.02	759.035	757.861	1.174
26	403.150	11.9055	11.9052	.00	820.817	820.943	-.127
26	413.150	11.9055	11.9027	.02	882.598	883.879	-1.280
26	273.150	12.0189	12.0058	.11	9.807	12.658	-2.852
26	283.150	12.0189	12.0090	.08	77.473	79.814	-2.342
26	293.150	12.0189	12.0163	.02	146.119	146.790	-.671
26	303.150	12.0189	12.0196	-.01	213.785	213.592	.193
26	313.150	12.0189	12.0197	-.01	280.470	280.225	.245
26	323.150	12.0189	12.0235	-.04	348.136	346.692	1.444
26	333.150	12.0189	12.0243	-.05	414.821	412.997	1.825
26	343.150	12.0189	12.0228	-.03	480.526	479.140	1.386
26	353.150	12.0189	12.0219	-.02	546.230	545.123	1.108
26	363.150	12.0189	12.0214	-.02	611.935	610.946	.988
26	373.150	12.0189	12.0214	-.02	677.640	676.613	1.027
26	383.150	12.0189	12.0172	.01	741.383	742.122	-.739
26	393.150	12.0189	12.0180	.01	807.087	807.474	-.387
26	403.150	12.0189	12.0150	.03	870.831	872.672	-1.841
26	413.150	12.0189	12.0125	.05	934.574	937.714	-3.141
26	273.150	12.1323	12.1269	.04	37.265	38.556	-1.291
26	283.150	12.1323	12.1319	.00	107.873	107.977	-.104
26	293.150	12.1323	12.1333	-.01	177.500	177.214	.286
26	303.150	12.1323	12.1351	-.02	247.128	246.274	.853
26	313.150	12.1323	12.1342	-.02	315.774	315.160	.614
26	323.150	12.1323	12.1368	-.04	385.401	383.875	1.527
26	333.150	12.1323	12.1395	-.06	455.029	452.420	2.609
26	343.150	12.1323	12.1398	-.06	523.675	520.797	2.878
26	353.150	12.1323	12.1406	-.07	592.322	589.007	3.315
26	363.150	12.1323	12.1416	-.08	660.968	657.051	3.917
26	373.150	12.1323	12.1385	-.05	727.653	724.930	2.724
26	383.150	12.1323	12.1360	-.03	794.339	792.644	1.694



Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE, (4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
26	393.150	12.1323	12.1340	-.01	861.024	860.195	.829
26	403.150	12.1323	12.1306	.01	926.728	927.583	-.855
26	413.150	12.1323	12.1296	.02	993.414	994.810	-1.396
26	273.150	12.2457	12.2454	.00	66.685	66.761	-.076
26	283.150	12.2457	12.2483	-.02	139.254	138.530	.724
26	293.150	12.2457	12.2513	-.05	211.824	210.113	1.711
26	303.150	12.2457	12.2516	-.05	283.412	281.514	1.899
26	313.150	12.2457	12.2523	-.05	355.001	352.735	2.266
26	323.150	12.2457	12.2534	-.06	426.589	423.779	2.810
26	333.150	12.2457	12.2523	-.05	497.197	494.647	2.551
26	343.150	12.2457	12.2541	-.07	568.786	565.339	3.446
26	353.150	12.2457	12.2517	-.05	638.413	635.858	2.555
26	363.150	12.2457	12.2520	-.05	709.021	706.203	2.817
26	373.150	12.2457	12.2505	-.04	778.648	776.376	2.272
26	383.150	12.2457	12.2516	-.05	849.256	846.377	2.879
26	393.150	12.2457	12.2490	-.03	917.902	916.206	1.696
26	403.150	12.2457	12.2451	.00	985.568	985.865	-.297
26	273.150	12.3591	12.3614	-.02	98.066	97.414	.652
26	283.150	12.3591	12.3655	-.05	173.578	171.620	1.957
26	293.150	12.3591	12.3666	-.06	248.108	245.636	2.472
26	303.150	12.3591	12.3682	-.07	322.639	319.465	3.173
26	313.150	12.3591	12.3700	-.09	397.169	393.109	4.060
26	323.150	12.3591	12.3696	-.09	470.719	466.569	4.150
26	333.150	12.3591	12.3698	-.09	544.269	539.846	4.423
26	343.150	12.3591	12.3703	-.09	617.819	612.941	4.878
26	353.150	12.3591	12.3668	-.06	689.407	685.853	3.554
26	363.150	12.3591	12.3641	-.04	760.996	758.585	2.411
26	373.150	12.3591	12.3639	-.04	833.565	831.137	2.429
26	383.150	12.3591	12.3622	-.03	905.154	903.508	1.646
26	393.150	12.3591	12.3610	-.02	976.742	975.700	1.042
26	273.150	12.4724	12.4813	-.07	133.370	130.666	2.704
26	283.150	12.4724	12.4859	-.11	211.824	207.403	4.421
26	293.150	12.4724	12.4876	-.12	289.296	283.945	5.351
26	303.150	12.4724	12.4897	-.14	366.769	360.295	6.474
26	313.150	12.4724	12.4895	-.14	443.261	436.453	6.808
26	323.150	12.4724	12.4899	-.14	519.752	512.420	7.332
26	333.150	12.4724	12.4862	-.11	594.283	588.197	6.086
26	343.150	12.4724	12.4875	-.12	670.775	663.784	6.991
26	353.150	12.4724	12.4850	-.10	745.305	739.181	6.124
26	363.150	12.4724	12.4812	-.07	818.855	814.390	4.466
26	373.150	12.4724	12.4781	-.05	892.405	889.409	2.996
26	383.150	12.4724	12.4773	-.04	966.936	964.240	2.696
26	273.150	12.5858	12.6007	-.12	171.616	166.678	4.939
26	283.150	12.5858	12.6027	-.13	252.031	246.044	5.987
26	293.150	12.5858	12.6023	-.13	331.465	325.210	6.255
26	303.150	12.5858	12.6025	-.13	410.899	404.178	6.721
26	313.150	12.5858	12.6031	-.14	490.333	482.947	7.385
26	323.150	12.5858	12.6020	-.13	568.786	561.518	7.267
26	333.150	12.5858	12.6014	-.12	647.239	639.891	7.348
26	343.150	12.5858	12.5972	-.09	723.731	718.066	5.665
26	353.150	12.5858	12.5939	-.06	800.223	796.042	4.180
26	363.150	12.5858	12.5930	-.06	877.695	873.821	3.874
26	373.150	12.5858	12.5908	-.04	954.187	951.402	2.785
26	383.150	12.5858	12.5874	-.01	1029.698	1028.787	.912
26	273.150	12.6992	12.7165	-.14	211.824	205.620	6.204
26	283.150	12.6992	12.7161	-.13	294.200	287.720	6.480

Table 9. Continued.

EQUATION OF STATE VS. PVT DATA. (1)VIRIAL EQN., (2)DAWSON, (3)BEATTIE,  
(4)DESCHNER, (5)REAMER, (13)CHERNEY, (17)TOMLINSON, (24)ELY, (26)DITTMAR.

ID	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,DIF
26	293.150	12.6992	12.7187	-.15	377.556	369.614	7.942
26	303.150	12.6992	12.7191	-.16	459.932	451.302	8.630
26	313.150	12.6992	12.7158	-.13	540.346	532.785	7.562
26	323.150	12.6992	12.7172	-.14	622.722	614.061	8.661
26	333.150	12.6992	12.7131	-.11	702.156	695.131	7.025
26	343.150	12.6992	12.7098	-.08	781.590	775.993	5.597
26	353.150	12.6992	12.7071	-.06	861.024	856.649	4.375
26	363.150	12.6992	12.7033	-.03	939.477	937.098	2.379
26	373.150	12.6992	12.7018	-.02	1018.911	1017.340	1.571
26	273.150	12.8126	12.8314	-.15	254.973	247.677	7.296
26	283.150	12.8126	12.8288	-.13	339.310	332.620	6.690
26	293.150	12.8126	12.8292	-.13	424.628	417.350	7.277
26	303.150	12.8126	12.8279	-.12	508.965	501.868	7.097
26	313.150	12.8126	12.8272	-.11	593.302	586.172	7.131
26	323.150	12.8126	12.8231	-.08	675.678	670.260	5.418
26	333.150	12.8126	12.8199	-.06	758.054	754.133	3.921
26	343.150	12.8126	12.8173	-.04	840.430	837.789	2.641
26	353.150	12.8126	12.8136	-.01	921.825	921.228	.597
26	363.150	12.8126	12.8106	.02	1003.220	1004.451	-1.231
26	273.150	12.9260	12.9452	-.15	301.064	293.043	8.021
26	283.150	12.9260	12.9426	-.13	388.343	380.946	7.398
26	293.150	12.9260	12.9408	-.11	475.623	468.628	6.994
26	303.150	12.9260	12.9377	-.09	561.921	556.089	5.832
26	313.150	12.9260	12.9353	-.07	648.220	643.327	4.893
26	323.150	12.9260	12.9318	-.05	733.537	730.340	3.198
26	333.150	12.9260	12.9290	-.02	818.855	817.127	1.728
26	343.150	12.9260	12.9235	.02	902.212	903.688	-1.476
26	353.150	12.9260	12.9204	.04	986.549	990.022	-3.473
26	273.150	13.0394	13.0575	-.14	350.097	341.929	8.169
26	283.150	13.0394	13.0549	-.12	440.319	432.913	7.406
26	293.150	13.0394	13.0510	-.09	529.559	523.669	5.890
26	303.150	13.0394	13.0462	-.05	617.819	614.193	3.626
26	313.150	13.0394	13.0422	-.02	706.079	704.484	1.594
26	323.150	13.0394	13.0390	.00	794.339	794.540	-.202
26	333.150	13.0394	13.0349	.03	881.618	884.360	-2.742
26	343.150	13.0394	13.0299	.07	967.916	973.942	-6.026
26	273.150	13.1528	13.1663	-.10	401.092	394.558	6.534
26	283.150	13.1528	13.1616	-.07	493.274	488.752	4.522
26	293.150	13.1528	13.1579	-.04	585.457	582.709	2.748
26	303.150	13.1528	13.1514	.01	675.678	676.423	-.745
26	313.150	13.1528	13.1477	.04	766.880	769.894	-3.014
26	323.150	13.1528	13.1431	.07	857.101	863.117	-6.016
26	333.150	13.1528	13.1378	.11	946.342	956.093	-9.751
26	343.150	13.1528	13.1318	.16	1034.602	1048.819	-14.218
26	273.150	13.2661	13.2736	-.06	455.029	451.168	3.860
26	283.150	13.2661	13.2688	-.02	550.153	548.710	1.443
26	293.150	13.2661	13.2632	.02	644.297	646.001	-1.704
26	303.150	13.2661	13.2569	.07	737.460	743.039	-5.579
26	313.150	13.2661	13.2532	.10	831.604	839.821	-8.217
26	323.150	13.2661	13.2472	.14	923.786	936.343	-12.557
26	333.150	13.2661	13.2407	.19	1014.988	1032.605	-17.617
26	273.150	13.3795	13.3740	.04	508.965	512.019	-3.054
26	283.150	13.3795	13.3693	.08	607.032	613.049	-6.018
26	293.150	13.3795	13.3638	.12	704.117	713.817	-9.700
26	303.150	13.3795	13.3592	.15	801.203	814.319	-13.116
26	313.150	13.3795	13.3526	.20	896.328	914.551	-18.223
26	323.150	13.3795	13.3454	.25	990.472	1014.510	-24.038

NP = 336, DNRMSPT = .360, PMEANDIF = 2.944



Table 10. Comparison with data for ideal gas functions.

PROPANE IDEAL GAS FUNCTIONS VIA CHAO ET AL. (1973)

ID	T,K	CPZ/R	CALCD	PCNT	(HZ-HZZ)/RT	CALCD	PCNT	SZ/R	CALCD	PCNT
1	50.000	4.096	4.084	.296	4.014	4.013	.024	22.353	22.355	-.009
1	100.000	4.967	4.987	-.409	4.254	4.254	-.001	25.433	25.433	-.001
1	150.000	5.868	5.854	.230	4.645	4.647	-.045	27.622	27.625	-.010
1	200.000	6.743	6.730	.201	5.059	5.056	.066	29.429	29.426	.011
1	273.150	8.268	8.289	-.250	5.707	5.706	.017	31.749	31.746	.008
1	298.150	8.852	8.874	-.246	5.946	5.947	-.016	32.498	32.497	.004
1	300.000	8.892	8.917	-.285	5.964	5.965	-.017	32.549	32.552	-.010
1	400.000	11.308	11.297	.089	6.998	7.002	-.047	35.442	35.444	-.006
1	500.000	13.542	13.519	.170	8.088	8.087	.011	38.210	38.208	.004
1	600.000	15.479	15.477	.014	9.162	9.159	.033	40.852	40.850	.004
1	700.000	17.160	17.172	-.070	10.188	10.186	.019	43.368	43.367	.003
1	800.000	18.614	18.634	-.103	11.152	11.153	-.006	45.758	45.757	.002
1	900.000	19.888	19.898	-.050	12.054	12.056	-.017	48.023	48.027	-.008
1	1000.000	21.000	20.996	.016	12.894	12.896	-.015	50.182	50.182	.000
1	1100.000	21.971	21.957	.063	13.677	13.677	-.003	52.230	52.229	.002
1	1200.000	22.821	22.803	.081	14.404	14.403	.005	54.177	54.176	.002
1	1300.000	23.556	23.552	.018	15.080	15.079	.010	56.034	56.032	.005
1	1400.000	24.200	24.219	-.076	15.709	15.708	.007	57.801	57.802	-.002
1	1500.000	24.764	24.816	-.210	16.294	16.296	-.008	59.491	59.494	-.003

NP = 19, CPRMSPT = .19, HRMSPT = .03, SRMSPT = .006

Table 10. Continued.

## PROPANE IDEAL GAS SPECIFIC HEATS, CPZ/R

(2) API(1952), (3) BEEK, (4) SAGE,  
 (5) KISTIAKOWSKY/LACHER, (6) KISTIAK./RICE,  
 (7) DAILEY, (8) ERNST, (9) ROSSINI VIA YESAVAGE.

ID	T,K	CPZ/R	CALCD	PCNT
2	100.000	4.952	4.987	-.72
2	298.150	8.842	8.874	-.36
2	700.000	17.210	17.172	.22
2	1000.000	21.050	20.996	.26
3	273.150	7.770	8.289	-6.68
3	373.150	10.135	10.665	-5.23
3	473.150	12.420	12.947	-4.24
3	573.150	14.433	14.978	-3.78
4	294.300	8.817	8.783	.39
4	310.900	9.088	9.177	-.97
4	327.600	9.350	9.576	-2.42
4	344.300	9.617	9.976	-3.74
4	360.900	9.893	10.374	-4.85
4	377.600	10.165	10.771	-5.96
4	394.300	10.432	11.164	-7.02
4	410.900	10.704	11.551	-7.91
4	427.600	10.970	11.934	-8.78
4	444.300	11.242	12.311	-9.51
5	148.200	5.883	5.825	.99
5	157.800	6.059	5.983	1.26
5	213.100	7.045	6.986	.85
5	219.000	7.131	7.105	.37
5	258.000	7.926	7.944	-.22
6	272.380	8.037	8.271	-2.92
6	300.370	8.796	8.926	-1.47
6	334.050	9.642	9.731	-.92
6	368.550	10.487	10.556	-.65
7	334.700	9.878	9.746	1.34
7	360.100	10.236	10.354	-1.16
7	387.800	10.875	11.012	-1.26
7	452.600	12.616	12.496	.95
7	521.000	14.035	13.953	.59
7	562.000	14.644	14.765	-.83
7	603.300	15.479	15.537	-.37
7	693.200	16.918	17.065	-.86
8	293.150	8.740	8.755	-.17
8	313.150	9.154	9.230	-.83
8	333.150	9.658	9.709	-.53
8	353.150	10.151	10.188	-.37
9	338.706	9.840	9.842	-.03
9	352.594	10.186	10.175	.11
9	366.483	10.528	10.507	.20
9	380.372	10.869	10.836	.30
9	394.261	11.206	11.163	.38
9	408.150	11.537	11.487	.43
9	422.039	11.857	11.807	.42

Table 11. Interpolated ideal gas functions.

## PROPANE IDEAL GAS FUNCTIONS, JOULES, MOLES, KELVINS.

T, K	EZ	HZ	SZ	CVZ	CPZ
80	2076.0	2741.1	202.599	29.75	38.07
90	2382.1	3130.4	207.182	31.48	39.79
100	2705.3	3536.8	211.461	33.15	41.47
110	3044.8	3959.4	215.488	34.73	43.04
120	3399.6	4397.3	219.297	36.21	44.53
130	3768.9	4849.7	222.918	37.63	45.94
140	4152.0	5316.0	226.373	39.00	47.31
150	4548.8	5796.0	229.683	40.36	48.67
160	4959.3	6289.6	232.868	41.73	50.05
170	5383.5	6797.0	235.944	43.13	51.45
180	5822.1	7318.7	238.925	44.58	52.90
190	6275.3	7855.1	241.825	46.08	54.40
200	6743.9	8406.8	244.654	47.64	55.95
210	7228.3	8974.3	247.423	49.25	57.57
220	7729.2	9558.3	250.139	50.93	59.24
230	8247.0	10159.3	252.811	52.65	60.97
240	8782.4	10777.8	255.443	54.43	62.74
250	9335.7	11414.3	258.041	56.25	64.56
260	9907.4	12069.1	260.609	58.11	66.42
270	10497.9	12742.8	263.151	60.00	68.31
280	11107.5	13435.5	265.670	61.92	70.23
290	11736.4	14147.5	268.168	63.86	72.18
300	12384.8	14879.1	270.648	65.83	74.14
310	13053.0	15630.4	273.112	67.80	76.12
320	13740.9	16401.5	275.560	69.79	78.11
330	14448.8	17192.5	277.994	71.78	80.10
340	15176.6	18003.5	280.414	73.78	82.09
350	15924.3	18834.4	282.823	75.77	84.08
360	16692.0	19685.1	285.219	77.76	86.07
370	17479.4	20555.7	287.605	79.74	88.05
380	18286.7	21446.1	289.979	81.71	90.02
390	19113.6	22356.2	292.343	83.67	91.98
400	19960.0	23285.8	294.696	85.62	93.93
410	20825.9	24234.7	297.039	87.55	95.86
420	21710.9	25203.0	299.372	89.46	97.78
430	22615.1	26190.3	301.695	91.36	99.68
440	23538.1	27196.4	304.008	93.24	101.56
450	24479.9	28221.3	306.312	95.10	103.42
460	25440.1	29264.7	308.605	96.94	105.26
470	26418.6	30326.4	310.888	98.76	107.07
480	27415.2	31406.1	313.161	100.56	108.87
490	28429.7	32503.7	315.424	102.33	110.65
500	29461.8	33619.0	317.677	104.09	112.40
510	30511.3	34751.6	319.920	105.82	114.13
520	31578.0	35901.5	322.153	107.52	115.84
530	32661.7	37068.3	324.375	109.21	117.52
540	33762.1	38251.9	326.588	110.87	119.19
550	34879.1	39451.9	328.790	112.51	120.82
560	36012.3	40668.3	330.981	114.13	122.44
570	37161.5	41900.7	333.163	115.72	124.04
580	38326.6	43148.9	335.334	117.29	125.61
590	39507.3	44412.8	337.494	118.84	127.16
600	40703.4	45692.0	339.644	120.37	128.68
610	41914.6	46986.3	341.783	121.87	130.19
620	43140.7	48295.6	343.912	123.36	131.67
630	44391.6	49619.7	346.031	124.82	133.13
640	45637.0	50958.2	348.139	126.26	134.57
650	46906.7	52311.0	350.236	127.67	135.99

Table 12. Specific heats along isobar  $P_b$ .

PROPANE CP AT 1500 PSI, CPTRP = 83.70

.719296234E+03    -.776704935E+04    .405746955E+05  
-.118438853E+06    .205520887E+06    -.210152230E+06  
.116726413E+06    -.270984921E+05    0.

T,K	J/MOL/K	CALCD	DIFF	PCNT
116.483	86.16	86.11	.05	.06
130.372	86.90	87.06	-.15	-.18
144.261	87.82	87.82	.01	.01
158.150	88.75	88.64	.10	.12
172.039	89.85	89.70	.16	.17
185.928	90.96	91.04	-.08	-.09
199.817	92.44	92.67	-.23	-.25
213.706	94.65	94.55	.10	.11
227.594	96.68	96.69	-.01	-.01
241.483	99.08	99.12	-.04	-.04
255.372	102.03	101.89	.14	.14
269.261	105.17	105.02	.15	.14
283.150	108.49	108.51	-.03	-.02
297.039	111.99	112.35	-.35	-.31
310.928	116.42	116.48	-.06	-.05
324.817	121.22	120.98	.24	.20
338.706	126.20	126.02	.18	.14
352.594	131.92	132.01	-.09	-.07
366.483	139.30	139.50	-.20	-.14
377.594	146.86	146.87	-.01	-.01
380.372	148.89	148.91	-.02	-.01
383.150	151.11	151.03	.08	.05
388.706	155.54	155.43	.11	.07
394.261	159.96	159.96	.00	.00
399.817	164.39	164.46	-.06	-.04
405.372	168.64	168.63	.01	.00

NP = 26, RMSPCT = .12

Table 13. Specific heats for the saturated liquid.

PROPANE SP. HEAT OF SATD. LIQUID, E = .800  
 (1)DANA, (2)KEMP, (8)CUTLER,  
 (30)RDG VIA YESAVAGE CP, EQNSTATE.

.42014101E+01 .79737878E+02 .18313347E+02  
 -.36564448E+02 .67003225E+02 0.

ID	WT	T,K	J/MOL/K	CALCD	PCNT
2	1.000	89.720	84.547	84.259	.34
8	1.000	91.060	83.973	84.328	-.42
8	1.000	93.430	84.224	84.451	-.27
2	1.000	95.530	84.756	84.562	.23
8	1.000	95.760	84.475	84.574	-.12
8	1.000	98.060	84.140	84.698	-.66
8	1.000	100.330	84.057	84.821	-.90
2	1.000	101.960	85.091	84.911	.21
8	1.000	102.570	84.726	84.945	-.26
8	1.000	104.780	85.061	85.070	-.01
2	1.000	108.500	85.426	85.283	.17
2	1.000	115.160	85.803	85.682	.14
2	1.000	121.970	86.179	86.113	.08
2	1.000	128.900	86.556	86.580	-.03
2	1.000	135.950	87.226	87.086	.16
2	1.000	142.790	87.435	87.612	-.20
2	1.000	149.740	88.147	88.184	-.04
2	1.000	156.850	88.691	88.811	-.14
2	1.000	164.390	89.360	89.529	-.19
2	1.000	172.020	89.863	90.313	-.50
2	1.000	179.090	90.742	91.098	-.39
2	1.000	185.900	91.662	91.909	-.27
2	1.000	194.280	92.792	92.989	-.21
2	1.000	200.940	93.839	93.917	-.08
2	1.000	207.090	94.257	94.831	-.61
2	1.000	213.100	95.429	95.783	-.37
2	1.000	219.250	96.266	96.819	-.57
2	1.000	224.960	97.480	97.841	-.37
2	1.000	229.810	98.275	98.758	-.49
1	0.000	241.760	99.820	101.221	-1.38
1	0.000	246.880	96.490	102.374	-5.75
1	0.000	252.820	100.550	103.792	-3.12
1	0.000	255.330	100.740	104.418	-3.52
1	0.000	261.550	105.720	106.045	-.31
1	0.000	264.740	97.790	106.924	-8.54
1	0.000	266.440	106.270	107.405	-1.06



Table 13. Continued.

PROPANE SP. HEAT OF SATD. LIQUID, E = .800  
(1)DANA, (2)KEMP, (8)CUTLER,  
(30)RDG VIA YESAVAGE CP, EQNSTATE.

.42014101E+01 .79737878E+02 .18313347E+02  
-.36564448E+02 .67003225E+02 0.

ID	WT	T,K	J/MOL/K	CALCD	PCNT
1	0.000	269.060	107.200	108.165	-.89
1	0.000	276.430	107.010	110.428	-3.10
1	0.000	276.780	111.440	110.541	.81
1	0.000	287.550	107.750	114.246	-5.69
1	0.000	291.590	110.890	115.773	-4.22
30	1.000	90.000	84.039	84.273	-.28
30	1.000	100.000	84.860	84.803	.07
30	1.000	110.000	85.848	85.371	.56
30	1.000	120.000	86.716	85.986	.85
30	1.000	130.000	87.424	86.657	.89
30	1.000	140.000	88.041	87.393	.74
30	1.000	150.000	88.665	88.206	.52
30	1.000	160.000	89.379	89.104	.31
30	1.000	170.000	90.237	90.099	.15
30	1.000	180.000	91.263	91.203	.07
30	1.000	190.000	92.461	92.426	.04
30	1.000	200.000	93.825	93.782	.05
30	1.000	210.000	95.351	95.285	.07
30	1.000	220.000	97.044	96.950	.10
30	1.000	230.000	98.916	98.794	.12
30	1.000	240.000	100.994	100.839	.15
30	1.000	250.000	103.307	103.108	.19
30	1.000	260.000	105.887	105.630	.24
30	1.000	270.000	108.767	108.443	.30
30	1.000	280.000	111.979	111.597	.34
30	1.000	290.000	115.566	115.162	.35
30	1.000	300.000	119.599	119.241	.30
30	1.000	310.000	124.219	123.995	.18
30	1.000	320.000	129.702	129.700	.00
30	1.000	330.000	136.627	136.882	-.19
30	1.000	340.000	146.278	146.709	-.29
30	1.000	350.000	162.174	162.479	-.19
30	1.000	360.000	199.625	199.396	.11

NP = 69, RMSPCT = .36

Table 14. The heats of vaporization.

PROPANE HEATS OF VAPORIZATION, E = .3800  
 (1) DANA, (2) KEMP, (3) SAGE, (4) STAVELY,  
 (5) HELGESON, (6) YESAVAGE, (7) CARRUTH,  
 (30) CLAPEYRON, (31) PATH TB,PB,T.

.98373471E+00 .41758440E+00 -.30674140E+00

ID	WT	T,K	KJ/MOL	CALCD	PCNT
31	0.000	90.000	24.708	23.783	3.89
31	0.000	100.000	24.245	23.507	3.14
31	0.000	110.000	23.810	23.224	2.52
31	0.000	120.000	23.391	22.933	2.00
31	0.000	130.000	22.983	22.634	1.54
31	0.000	140.000	22.582	22.325	1.15
31	0.000	150.000	22.185	22.006	.81
31	0.000	160.000	21.791	21.676	.53
31	1.000	170.000	21.398	21.333	.30
31	1.000	180.000	21.002	20.975	.13
31	1.000	190.000	20.601	20.602	-.01
31	1.000	200.000	20.193	20.212	-.09
31	1.000	210.000	19.774	19.802	-.14
31	1.000	220.000	19.341	19.371	-.15
31	1.000	230.000	18.890	18.915	-.14
31	1.000	240.000	18.415	18.433	-.10
31	1.000	250.000	17.912	17.919	-.04
31	1.000	260.000	17.374	17.371	.02
31	1.000	270.000	16.793	16.782	.07
31	1.000	280.000	16.163	16.146	.10
31	1.000	290.000	15.473	15.455	.11
31	1.000	300.000	14.712	14.698	.10
31	1.000	310.000	13.867	13.858	.06
31	1.000	320.000	12.917	12.916	.01
31	1.000	330.000	11.831	11.836	-.05
31	1.000	340.000	10.555	10.563	-.08
31	1.000	350.000	8.977	8.983	-.07
31	1.000	360.000	6.792	6.794	-.02

NP = 28, RMSPCT = .111

Table 14. Continued.

PROPANE HEATS OF VAPORIZATION, E = .3800  
 (1) DANA, (2) KEMP, (3) SAGE, (4) STAVELY,  
 (5) HELGESON, (6) YESAVAGE, (7) CARRUTH,  
 (30) CLAPEYRON, (31) PATH T8,PB,T.

.98373471E+00 .41758440E+00 -.30674140E+00

ID	WT	T,K	KJ/MOL	CALCD	PCNT
30	0.000	90.000	22.746	23.783	-4.36
30	0.000	100.000	22.682	23.507	-3.51
30	0.000	110.000	22.659	23.224	-2.43
30	0.000	120.000	22.610	22.933	-1.41
30	0.000	130.000	22.503	22.634	-.58
30	0.000	140.000	22.331	22.325	.02
30	0.000	150.000	22.094	22.006	.40
30	0.000	160.000	21.803	21.676	.58
30	0.000	170.000	21.465	21.333	.62
30	0.000	180.000	21.091	20.975	.55
30	0.000	190.000	20.689	20.602	.42
30	0.000	200.000	20.264	20.212	.26
30	0.000	210.000	19.821	19.802	.09
30	0.000	220.000	19.359	19.371	-.06
30	0.000	230.000	18.880	18.915	-.19
30	0.000	240.000	18.381	18.433	-.28
30	0.000	250.000	17.858	17.919	-.34
30	0.000	260.000	17.305	17.371	-.38
30	0.000	270.000	16.717	16.782	-.39
30	0.000	280.000	16.085	16.146	-.38
30	0.000	290.000	15.399	15.455	-.36
30	0.000	300.000	14.647	14.698	-.34
30	0.000	310.000	13.813	13.858	-.33
30	0.000	320.000	12.873	12.916	-.33
30	0.000	330.000	11.793	11.836	-.37
30	0.000	340.000	10.515	10.563	-.45
30	0.000	350.000	8.929	8.983	-.60
30	0.000	360.000	6.746	6.794	-.70
1	0.000	234.070	18.441	18.722	-1.50
1	0.000	237.750	17.856	18.544	-3.71
1	0.000	241.830	18.242	18.341	-.54
1	0.000	247.100	17.873	18.072	-1.10
1	0.000	253.740	17.819	17.719	.57
1	0.000	261.210	17.397	17.302	.55
1	0.000	269.100	16.865	16.837	.17
1	0.000	275.420	16.330	16.444	-.69
1	0.000	279.890	16.524	16.153	2.29
1	0.000	281.850	15.814	16.023	-1.30
1	0.000	285.530	15.738	15.772	-.21
1	0.000	287.150	15.795	15.658	.87
1	0.000	292.200	15.356	15.295	.40
1	0.000	292.700	15.596	15.258	2.22
2	0.000	231.090	18.780	18.864	-.45
3	0.000	312.817	13.627	13.605	.17
3	0.000	312.983	13.649	13.589	.44
3	0.000	316.206	13.360	13.287	.55
3	0.000	316.372	13.551	13.272	2.11
3	0.000	316.483	13.551	13.261	2.19

Table 14. Continued.

PROPANE HEATS OF VAPORIZATION, E = .3800  
 (1) DANA, (2) KEMP, (3) SAGE, (4) STAVELY,  
 (5) HELGESON, (6) YESAVAGE, (7) CARRUTH,  
 (30) CLAPEYRON, (31) PATH TB, PB, T.

.98373471E+00 .41758440E+00 -.30674140E+00

ID	WT	T,K	KJ/MOL	CALCD	PCNT
3	0.000	316.539	13.282	13.256	.20
3	0.000	318.928	13.171	13.023	1.14
3	0.000	320.983	13.127	12.816	2.42
3	0.000	321.150	13.143	12.799	2.68
3	0.000	327.983	12.284	12.067	1.79
3	0.000	328.094	12.224	12.055	1.40
3	0.000	335.594	11.297	11.153	1.29
3	0.000	335.650	11.344	11.146	1.78
3	0.000	345.706	10.205	9.711	5.09
3	0.000	346.039	10.188	9.657	5.49
3	0.000	348.150	9.648	9.307	3.66
4	0.000	185.000	20.690	20.791	-.48
4	0.000	213.200	19.660	19.666	-.03
5	0.000	310.928	13.651	13.776	-.91
5	0.000	322.039	12.592	12.708	-.91
5	0.000	327.594	11.989	12.111	-1.01
5	0.000	330.372	11.612	11.793	-1.53
6	0.000	231.094	18.778	18.864	-.46
6	0.000	263.206	17.148	17.187	-.23
6	0.000	285.928	15.734	15.744	-.06
6	0.000	301.317	14.617	14.592	.17
6	0.000	313.428	13.633	13.548	.63
6	0.000	323.428	12.649	12.563	.68
6	0.000	331.817	11.624	11.622	.02
6	0.000	339.483	10.578	10.635	-.54
6	0.000	346.206	9.512	9.630	-1.23
6	0.000	352.428	8.405	8.528	-1.44
6	0.000	358.039	7.216	7.304	-1.20
6	0.000	363.372	5.873	5.749	2.15
6	0.000	367.039	4.449	4.125	7.85
7	0.000	110.946	23.719	23.197	2.25
7	0.000	118.342	23.391	22.982	1.78
7	0.000	125.739	23.068	22.763	1.34
7	0.000	133.135	22.770	22.538	1.03
7	0.000	140.532	22.460	22.309	.68
7	0.000	147.928	22.182	22.073	.49
7	0.000	155.324	21.887	21.832	.25
7	0.000	162.721	21.631	21.584	.22
7	0.000	170.117	21.326	21.328	-.01
7	0.000	177.514	20.989	21.065	-.36
7	0.000	184.910	20.745	20.794	-.24
7	0.000	192.306	20.459	20.514	-.27
7	0.000	199.703	20.144	20.224	-.39
7	0.000	207.099	20.014	19.923	.46
7	0.000	214.496	19.504	19.611	-.54
7	0.000	221.892	19.189	19.286	-.51
7	0.000	229.288	18.857	18.949	-.48
7	0.000	236.685	18.500	18.596	-.52

Table 15. Comparison with specific heat data of Ernst.

ERNST PROPANE CP(T,P), J/MOL/K, ALONG ISOTHERMS

THE ISOTHERM AT T = 293.15 K

P,BAR	MOL/L	CP(P)	CALCD	PCNT	CP-CPZ	CALCD	DIFF
0.000	0.000	72.67	72.80	-.17	0.00	0.00	0.00
.490	.020	73.06	73.22	-.22	.39	.43	-.04
.981	.041	73.51	73.66	-.20	.84	.86	-.02
1.961	.083	74.47	74.62	-.20	1.80	1.82	-.02
3.432	.150	76.32	76.34	-.02	3.65	3.54	.11
4.903	.221	78.48	78.47	.01	5.81	5.68	.13
6.374	.297	81.13	81.20	-.09	8.46	8.40	.06
7.845	.379	84.57	84.85	-.33	11.90	12.06	-.16

THE ISOTHERM AT T = 313.15 K

P,BAR	MOL/L	CP(P)	CALCD	PCNT	CP-CPZ	CALCD	DIFF
0.000	0.000	76.11	76.74	-.83	0.00	0.00	0.00
.490	.019	76.53	77.09	-.73	.42	.35	.07
.981	.038	76.95	77.44	-.63	.84	.69	.15
1.961	.078	77.79	78.18	-.51	1.68	1.44	.24
3.432	.139	79.19	79.46	-.34	3.08	2.72	.36
4.903	.203	80.63	80.96	-.40	4.52	4.21	.31
6.374	.270	82.44	82.72	-.34	6.33	5.98	.35
7.845	.342	84.61	84.82	-.25	8.50	8.08	.42
9.807	.445	88.01	88.37	-.41	11.90	11.63	.27
11.768	.558	93.18	93.24	-.07	17.07	16.50	.57

THE ISOTHERM AT T = 333.15 K

P,BAR	MOL/L	CP(P)	CALCD	PCNT	CP-CPZ	CALCD	DIFF
0.000	0.000	80.30	80.72	-.53	0.00	0.00	0.00
.490	.018	80.55	81.01	-.57	.25	.29	-.04
.981	.036	80.93	81.30	-.45	.63	.57	.06
1.961	.073	81.54	81.89	-.43	1.24	1.17	.07
3.432	.129	82.56	82.89	-.39	2.26	2.16	.10
4.903	.188	83.56	84.01	-.53	3.26	3.28	-.02
6.374	.249	85.00	85.27	-.32	4.70	4.55	.15
7.845	.313	86.45	86.71	-.30	6.15	5.99	.16
9.807	.403	88.65	88.95	-.34	8.35	8.23	.12
11.768	.499	91.28	91.68	-.43	10.98	10.95	.03
13.729	.603	94.95	95.08	-.14	14.65	14.35	.30

THE ISOTHERM AT T = 353.15 K

P,BAR	MOL/L	CP(P)	CALCD	PCNT	CP-CPZ	CALCD	DIFF
0.000	0.000	84.40	84.71	-.37	0.00	0.00	0.00
.490	.017	84.59	84.95	-.43	.19	.24	-.05
.981	.034	84.79	85.19	-.47	.39	.48	-.09
1.961	.068	85.36	85.68	-.37	.96	.97	-.01
3.432	.121	86.19	86.47	-.33	1.79	1.76	.03
4.903	.175	86.97	87.35	-.43	2.57	2.64	-.07
6.374	.232	88.01	88.31	-.34	3.61	3.60	.01
7.845	.290	89.02	89.37	-.39	4.62	4.66	-.04
9.807	.371	90.65	90.96	-.34	6.25	6.25	.00
11.768	.456	92.39	92.78	-.42	7.99	8.07	-.08
13.729	.545	94.37	94.89	-.55	9.97	10.18	-.21

NP = 40, AVPCT = .37, AVDIF = .12



Table 16. Comparison with specific heat data of Yesavage.

YESAVAGE CP(T) ISOBAR AT P,BAR = 17.237

T,K	MOL/L	J/MOL/K	CALCD	PCNT
116.483	15.930	85.79	85.71	.10
144.261	15.296	87.64	87.64	-.00
172.039	14.653	89.85	90.18	-.37
199.817	13.992	93.17	93.57	-.42
227.594	13.301	97.79	98.11	-.33
255.372	12.558	104.06	104.28	-.21
283.150	11.726	112.73	113.01	-.25
310.928	10.723	128.41	127.03	1.08
338.706	.785	101.85	102.04	-.19
366.483	.673	98.89	99.34	-.45
394.261	.599	102.03	101.09	.92

YESAVAGE CP(T) ISOBAR AT P,BAR = 34.474

T,K	MOL/L	J/MOL/K	CALCD	PCNT
116.483	15.945	85.98	85.65	.38
144.261	15.316	87.64	87.56	.09
172.039	14.679	89.67	90.05	-.43
199.817	14.025	92.80	93.36	-.60
227.594	13.345	97.60	97.76	-.16
255.372	12.618	103.51	103.65	-.14
283.150	11.814	112.18	111.74	.39
310.928	10.869	124.17	123.76	.33
338.706	9.615	150.37	147.48	1.92
366.483	1.881	157.57	162.12	-2.89
394.261	1.434	122.14	120.64	1.23
422.039	1.225	114.02	115.15	-.99

YESAVAGE CP(T) ISOBAR AT P,BAR = 68.948

T,K	MOL/L	J/MOL/K	CALCD	PCNT
116.483	15.975	85.98	85.54	.50
144.261	15.355	87.64	87.40	.28
172.039	14.728	89.48	89.81	-.36
199.817	14.089	92.62	92.97	-.38
227.594	13.428	97.05	97.13	-.08
255.372	12.730	102.77	102.57	.20
283.150	11.973	110.15	109.70	.40
310.928	11.117	118.82	119.28	-.38
338.706	10.089	133.21	133.02	.14
366.483	8.694	159.23	159.15	.05
394.261	6.057	267.53	257.01	3.93
422.039	3.515	176.38	177.81	-.81

Table 16. Continued.

## YESAVERAGE CP(T) ISOBAR AT P, BAR = 103.421

T,K	MOL/L	J/MOL/K	CALCD	PCNT
116.483	16.003	86.16	85.44	.83
144.261	15.392	87.82	87.25	.66
172.039	14.776	89.85	89.58	.30
199.817	14.150	92.44	92.62	-.20
227.594	13.507	96.68	96.58	.11
255.372	12.834	102.03	101.66	.37
283.150	12.115	108.49	108.12	.34
310.928	11.324	116.42	116.28	.12
338.706	10.423	126.20	126.44	-.19
366.483	9.348	139.30	139.50	-.14
394.261	7.991	159.96	159.96	.00
422.039	6.279	177.68	180.02	-1.32

## YESAVERAGE CP(T) ISOBAR AT P, BAR = 137.895

T,K	MOL/L	J/MOL/K	CALCD	PCNT
116.483	16.032	86.16	85.35	.94
144.261	15.428	88.01	87.11	1.02
172.039	14.822	90.22	89.37	.94
199.817	14.208	92.44	92.31	.14
227.594	13.581	96.31	96.09	.23
255.372	12.930	101.29	100.88	.40
283.150	12.243	107.20	106.85	.32
310.928	11.503	113.84	114.10	-.23
338.706	10.686	122.51	122.48	.02
366.483	9.768	131.55	131.75	-.16
394.261	8.723	146.13	143.66	1.69

NP = 58, MEANPCT = .55

Table 17. Comparisons with speed of sound data.

## RAO PROPANE SPEED OF SOUND FOR SATD. LIQUID

T,K	MOL/L	M/SEC	CALCD	PCNT
140.000	15.375	1528	1727	-12.96
145.000	15.259	1499	1688	-12.60
150.000	15.144	1469	1649	-12.29
155.000	15.027	1439	1612	-12.02
160.000	14.910	1409	1575	-11.80
165.000	14.793	1379	1540	-11.62
170.000	14.676	1350	1505	-11.49
175.000	14.557	1320	1470	-11.40
180.000	14.438	1290	1436	-11.35
185.000	14.319	1260	1403	-11.34
190.000	14.198	1230	1370	-11.38
195.000	14.077	1200	1338	-11.45
200.000	13.954	1171	1306	-11.57
205.000	13.831	1141	1275	-11.72
210.000	13.707	1111	1243	-11.92
215.000	13.581	1081	1213	-12.16
220.000	13.454	1051	1182	-12.44
225.000	13.326	1021	1152	-12.76
230.000	13.196	992	1122	-13.12

NP = 19, MEANPCT = 11.97

Table 17. Continued.

## LACAM PROPANE SPEED OF SOUND AT T,K = 298.15

P,BAR	MOL/L	M/SEC	CALCD	PCNT
10.133	11.165	724	718	.83
20.265	11.235	742	735	.92
30.398	11.302	758	751	.84
40.530	11.365	774	767	.86
43.570	11.383	778	771	.77
50.663	11.425	790	782	.95
60.795	11.482	804	797	.86
70.928	11.537	819	811	.95
81.060	11.589	833	824	.97
91.193	11.640	847	838	1.04
101.325	11.689	860	851	1.04
126.656	11.803	893	881	1.24
151.988	11.909	924	911	1.40
177.319	12.008	953	938	1.50
202.650	12.100	979	965	1.42
253.313	12.269	1017	1014	.22
303.975	12.421	1070	1061	.84
354.638	12.560	1110	1104	.49
405.300	12.687	1146	1145	.01
506.625	12.914	1214	1222	-.73
607.950	13.113	1275	1294	-1.50
709.275	13.291	1331	1360	-2.24
810.600	13.451	1384	1423	-2.87
911.925	13.598	1432	1483	-3.61
1013.250	13.732	1482	1540	-3.98

## LACAM PROPANE SPEED OF SOUND AT T,K = 323.15

P,BAR	MOL/L	M/SEC	CALCD	PCNT
10.133	.439	520	231	55.52
20.265	10.213	552	564	-2.34
30.398	10.332	581	589	-1.51
40.530	10.438	608	612	-.73
43.570	10.468	615	618	-.64
50.663	10.535	632	633	-.23
60.795	10.625	652	653	-.17
70.928	10.709	672	671	.06
81.060	10.787	695	689	.84
91.193	10.860	709	705	.44
101.325	10.930	727	721	.71
126.656	11.089	766	759	.89
151.988	11.232	803	793	1.19
177.319	11.361	834	825	1.05
202.650	11.480	864	855	1.02
253.313	11.692	918	910	.83
303.975	11.878	966	960	.54
354.638	12.044	1011	1007	.35
405.300	12.194	1052	1051	.07
506.625	12.459	1126	1132	-.55
607.950	12.686	1192	1206	-1.18
709.275	12.887	1252	1274	-1.81
810.600	13.067	1308	1339	-2.37
911.925	13.229	1360	1399	-2.94
1013.250	13.378	1408	1458	-3.55

Table 17. Continued.

## LACAM PROPANE SPEED OF SOUND AT T,K = 369.95

P,BAR	MOL/L	M/SEC	CALCD	PCNT
10.133	.361	254	258	-1.58
20.265	.809	231	235	-2.03
30.398	1.430	204	207	-1.52
40.530	2.759	165	162	1.80
43.570	6.605	154	193	-25.35
50.663	7.641	264	278	-5.31
60.795	8.187	340	340	-.24
70.928	8.527	387	385	.32
81.060	8.782	425	422	.66
91.193	8.988	457	453	.78
101.325	9.163	487	481	1.22
126.656	9.515	550	539	1.86
151.988	9.791	601	588	2.03
177.319	10.021	643	631	1.76
202.650	10.219	682	670	1.74
253.313	10.551	748	737	1.37
303.975	10.824	805	796	1.02
354.638	11.057	855	849	.59
405.300	11.261	902	898	.38
506.625	11.609	995	986	.87
607.950	11.898	1056	1064	-.84
709.275	12.146	1120	1136	-1.49
810.600	12.364	1179	1203	-2.07
911.925	12.559	1234	1266	-2.60
1013.250	12.735	1286	1325	-3.06

## LACAM PROPANE SPEED OF SOUND AT T,K = 398.15

P,BAR	MOL/L	M/SEC	CALCD	PCNT
10.133	.328	266	271	-1.99
20.265	.712	251	254	-1.47
30.398	1.176	234	236	-.99
40.530	1.782	212	215	-1.52
43.570	2.009	205	208	-1.70
50.663	2.678	192	193	-.71
60.795	4.182	182	185	-1.85
70.928	5.789	223	217	2.62
81.060	6.745	273	264	3.11
91.193	7.311	318	308	3.05
101.325	7.703	356	345	2.83
126.656	8.355	433	421	2.66
151.988	8.792	493	480	2.44
177.319	9.126	542	531	2.03
202.650	9.399	589	574	2.43
253.313	9.832	661	649	1.74
303.975	10.173	723	713	1.34
354.638	10.455	788	769	2.32
405.300	10.698	827	820	.75
506.625	11.102	914	911	.24
607.950	11.432	990	992	-.24
709.275	11.711	1056	1065	-.90
810.600	11.954	1117	1133	-1.45
911.925	12.169	1174	1196	-1.91
1013.250	12.362	1226	1256	-2.46

Table 17. Continued.

## LACAM PROPANE SPEED OF SOUND AT T,K = 423.15

P,BAR	MOL/L	M/SEC	CALCD	PCNT
10.133	.305	277	282	-1.81
20.265	.648	265	268	-1.42
30.398	1.042	252	255	-1.23
40.530	1.505	238	240	-1.11
43.570	1.661	233	236	-1.40
50.663	2.069	223	226	-1.48
60.795	2.776	213	214	-.88
70.928	3.646	211	211	-.18
81.060	4.584	218	221	-1.51
91.193	5.419	243	241	.69
101.325	6.090	275	267	2.65
126.656	7.178	352	340	3.28
151.988	7.830	415	404	2.61
177.319	8.290	468	458	2.09
202.650	8.646	515	505	1.91
253.313	9.186	597	584	2.07
303.975	9.595	660	651	1.28
354.638	9.926	716	710	.81
405.300	10.205	757	762	-.78
506.625	10.660	854	855	-.23
607.950	11.027	931	937	-.73
709.275	11.334	1000	1011	-1.17
810.600	11.599	1064	1079	-1.49
911.925	11.832	1124	1143	-1.73
1013.250	12.040	1180	1203	-1.98

## LACAM PROPANE SPEED OF SOUND AT T,K = 448.15

P,BAR	MOL/L	M/SEC	CALCD	PCNT
10.133	.285	287	291	-1.74
20.265	.598	275	281	-2.26
30.398	.945	262	270	-3.28
40.530	1.332	250	259	-3.98
43.570	1.458	247	256	-3.96
50.663	1.771	241	249	-3.59
60.795	2.271	236	240	-2.08
70.928	2.839	234	235	-.58
81.060	3.462	235	234	.08
91.193	4.107	238	240	-1.13
101.325	4.722	247	252	-2.32
126.656	5.980	304	296	2.33
151.988	6.839	364	351	3.51
177.319	7.438	417	403	3.20
202.650	7.888	463	451	2.57
253.313	8.545	540	532	1.36
303.975	9.026	608	601	1.09
354.638	9.406	667	661	.84
405.300	9.721	720	715	.68
506.625	10.230	810	809	.06
607.950	10.632	888	892	-.45
709.275	10.967	958	966	-.87
810.600	11.253	1022	1034	-1.24
911.925	11.504	1082	1098	-1.51
1013.250	11.727	1138	1158	-1.78



Table 17. Continued.

## LACAM PROPANE SPEED OF SOUND AT T,K = 473.15

P,BAR	MOL/L	M/SEC	CALCD	PCNT
10.133	.268	299	301	-.80
20.265	.557	290	292	-.85
30.398	.869	280	284	-1.44
40.530	1.208	271	275	-1.81
43.570	1.315	269	273	-1.68
50.663	1.577	264	268	-1.59
60.795	1.979	259	261	-.99
70.928	2.417	256	256	-.31
81.060	2.884	255	254	.12
91.193	3.372	256	255	.04
101.325	3.865	261	260	.07
126.656	5.003	291	287	1.30
151.988	5.917	337	324	3.72
177.319	6.615	380	367	3.20
202.650	7.149	424	411	2.94
253.313	7.921	500	491	1.75
303.975	8.472	564	560	.68
354.638	8.902	621	620	.06
405.300	9.253	674	674	-.12
506.625	9.812	767	769	-.36
607.950	10.250	846	852	-.77
709.275	10.611	916	926	-1.18
810.600	10.918	980	995	-1.54
911.925	11.186	1040	1058	-1.78
1013.250	11.423	1096	1118	-2.03

## LACAM PROPANE SPEED OF SOUND AT T,K = 498.15

P,BAR	MOL/L	M/SEC	CALCD	PCNT
10.133	.253	308	310	-.75
20.265	.522	301	302	-.62
30.398	.808	295	296	-.36
40.530	1.112	288	289	-.59
43.570	1.207	287	287	-.31
50.663	1.435	282	283	-.66
60.795	1.779	278	278	-.29
70.928	2.143	274	275	-.38
81.060	2.525	273	272	.01
91.193	2.920	273	272	.00
101.325	3.321	275	275	-.10
126.656	4.300	293	291	.60
151.988	5.161	326	317	2.46
177.319	5.878	360	350	2.68
202.650	6.460	395	386	2.11
253.313	7.325	465	460	1.06
303.975	7.942	529	527	.34
354.638	8.417	586	587	-.20
405.300	8.804	640	641	-.19
506.625	9.411	734	736	-.29
607.950	9.882	814	818	-.57
709.275	10.268	885	892	-.87
810.600	10.595	948	960	-1.32
911.925	10.879	1009	1023	-1.45
1013.250	11.129	1065	1083	-1.69

NP = 200, MEANPCT = 1.77

TABLE 18. Comparison of enthalpy differences at 60 bar

<u>T, K</u>	<u><math>\Delta H</math>, J/mol</u>		<u><math>\partial H/\partial P</math>, J/mol/bar</u>
	Kuloor [41] <u>P = 60 atm</u>	This Report <u>P = 60 bar</u>	
230	0	0	4.3
250	1,964	2,011	3.9
300	7,063	7,443	1.4
350	13,440	13,772	- 9.8
400	24,685	23,913	-216.1
500	39,184	39,264	- 50.9
600	52,335	52,490	- 28.8

TABLE 19. Comparison of enthalpy differences at 400 K

<u>P</u>	This Report	<u>- ΔH, J/mol</u>		$\partial H/\partial P$ <u>J/mol/bar</u>
	<u>P in bar</u>	Kuloor [41] <u>P in atm</u>	Eubank [24] <u>P in atm</u>	
0	0	0	0	
1	67	63	71	- 73
20	1,485	1,407	1,575	- 84
40	3,507	3,425	3,698	-126
50	4,972	4,999	5,226	-172
60	6,995	7,051	7,318	-216
100	11,018	11,041	11,280	- 31
200	12,098	12,251	12,301	- 3.2
300	12,181	12,228	12,369	+ 0.8
400	12,018	12,108	12,198	2.3
450	11,889		12,067	2.8
500	11,739	11,790		3.2

TABLE 20. Comparison of residual specific heats at 400 K

<u>P</u>	This Report <u>P in bar</u>	<u><math>C_p(\rho,T) - C_p^0(T)</math>, J/mol/K</u>		Eubank [24] <u>P in atm</u>
		Kuloor [41]		
		<u>P in atm</u>		
0	0	0	0	
1	0.2	0.4	0.4	
20	9.6	7.5	11.2	
40	35.1	30.6	38.2	
50	79.7		76.6	
60	147.2		151.1	
100	74.3	73.3	198.3	
200	40.5	39.8	86.0	
300	33.8	31.4	63.3	
400	30.7	28.1	53.2	
450	29.6		50.1	
500	28.8	26.4		

Table 21. Loop closure for the saturated vapor.

LOOP CLOSURE FOR SATURATED VAPOR, HL,SL VIA PATH TA AND CSAT. Q,VAP VIA CLAPEYRON, HG,SG VIA IDEAL GAS AND EQNSTATE, JOULES,MOLES,KELVINS.										
T,K	CSAT	HL	SL	Q,VAP	HL+Q	HG	DIFF	SL+Q/T	SG	DIFF
85.47	84.04	5508.6	82.628	22822.8	28331.4	30428.1	-2096.7	349.655	368.423	-18.768
90.00	84.27	5889.8	86.973	22746.4	28636.2	30584.8	-1948.6	339.711	356.978	-17.267
95.00	84.53	6311.8	91.536	22702.4	29014.2	30770.1	-1755.8	330.508	345.777	-15.269
100.00	84.80	6735.2	95.878	22681.8	29417.0	30966.2	-1549.2	322.697	335.858	-13.162
105.00	85.08	7159.9	100.022	22670.7	29830.6	31171.4	-1340.9	315.934	327.037	-11.104
110.00	85.37	7586.0	103.986	22659.2	30245.2	31384.4	-1139.2	309.979	319.164	-9.185
115.00	85.67	8013.6	107.787	22640.4	30654.0	31603.7	-949.7	304.660	312.113	-7.453
120.00	85.99	8442.8	111.440	22609.8	31052.5	31828.4	-775.9	299.855	305.783	-5.928
125.00	86.31	8873.5	114.956	22564.6	31438.1	32057.8	-619.7	295.473	300.085	-4.611
130.00	86.66	9305.9	118.348	22503.3	31809.2	32291.0	-481.8	291.450	294.946	-3.496
135.00	87.02	9740.1	121.625	22425.3	32165.4	32527.7	-362.3	287.738	290.304	-2.566
140.00	87.39	10176.1	124.796	22330.7	32506.8	32767.3	-260.5	284.301	286.105	-1.804
145.00	87.79	10614.1	127.869	22220.1	32834.1	33009.6	-175.5	281.111	282.303	-1.192
150.00	88.21	11054.0	130.852	22094.4	33148.4	33254.4	-105.9	278.148	278.858	-0.710
155.00	88.64	11496.2	133.752	21954.8	33451.0	33501.4	-50.4	275.396	275.735	-0.339
160.00	89.10	11940.5	136.573	21802.5	33743.1	33750.5	-7.5	272.839	272.902	-0.063
165.00	89.59	12387.3	139.322	21638.8	34026.1	34001.7	24.4	270.466	270.333	.134
170.00	90.10	12836.6	142.004	21464.9	34301.5	34254.8	46.7	268.268	268.003	.265
175.00	90.64	13288.5	144.623	21281.9	34570.4	34509.7	60.7	266.234	265.891	.344
180.00	91.20	13743.2	147.185	21091.0	34834.2	34766.3	67.8	264.357	263.977	.380
185.00	91.80	14200.8	149.691	20893.0	35093.8	35024.7	69.2	262.627	262.244	.383
190.00	92.43	14661.6	152.148	20688.8	35350.4	35284.5	65.8	261.036	260.676	.360
195.00	93.09	15125.6	154.557	20479.0	35604.6	35545.8	58.8	259.577	259.259	.318
200.00	93.78	15593.2	156.922	20264.1	35857.3	35808.3	48.9	258.243	257.979	.263
205.00	94.51	16064.4	159.247	20044.5	36108.9	36071.9	37.0	257.025	256.826	.199
210.00	95.28	16539.5	161.533	19820.5	36360.0	36336.4	23.6	255.917	255.787	.130
215.00	96.10	17018.7	163.785	19592.1	36610.8	36601.4	9.4	254.911	254.852	.058
220.00	96.95	17502.3	166.004	19359.3	36861.7	36866.9	-5.2	254.001	254.013	-0.013
225.00	97.85	17990.5	168.192	19122.1	37112.7	37132.4	-19.8	253.180	253.261	-0.082
230.00	98.79	18483.6	170.353	18880.2	37363.8	37398.1	-34.2	252.441	252.589	-0.147
231.07	99.00	18589.9	170.813	18827.8	37417.6	37454.8	-37.2	252.293	252.454	-0.161



Table 22. Comparison with vapor pressure of Tsai

PROPANE VAPOR PRESSURES OF TSAI

T,K	P,BAR	CALCD	PCNT
85.47	.4917E-08	.3000E-08	63.90
86.00	.6000E-08	.3657E-08	64.07
88.00	.1245E-07	.7555E-08	64.83
90.00	.2493E-07	.1512E-07	64.93
95.00	.1243E-06	.7536E-07	64.88
100.00	.5226E-06	.3199E-06	63.36
105.00	.1907E-05	.1182E-05	61.26
110.00	.6119E-05	.3873E-05	57.98
115.00	.1760E-04	.1142E-04	54.06
120.00	.4640E-04	.3071E-04	51.09
125.00	.1121E-03	.7606E-04	47.41
130.00	.2520E-03	.1752E-03	43.85
135.00	.5306E-03	.3780E-03	40.36
140.00	.1057E-02	.7697E-03	37.35
145.00	.2000E-02	.1487E-02	34.46
150.00	.3533E-02	.2741E-02	28.90
155.00	.6146E-02	.4840E-02	27.00
160.00	.1027E-01	.8220E-02	24.90
165.00	.1653E-01	.1347E-01	22.69
170.00	.2586E-01	.2139E-01	20.92
175.00	.3933E-01	.3297E-01	19.31
180.00	.5826E-01	.4945E-01	17.81
185.00	.8399E-01	.7238E-01	16.05
190.00	.1187E+00	.1035E+00	14.60
195.00	.1640E+00	.1451E+00	13.05
200.00	.2226E+00	.1993E+00	11.69
205.00	.2960E+00	.2691E+00	9.98
210.00	.3866E+00	.3574E+00	8.18
215.00	.4986E+00	.4675E+00	6.65
220.00	.6319E+00	.6031E+00	4.79
225.00	.7893E+00	.7679E+00	2.78
230.00	.9719E+00	.9661E+00	.61
231.00	.1011E+01	.1010E+01	.05

Table 23. Comparison with heats of vaporization of Tsai.

PROPANE HEATS OF VAPORIZATION OF TSAI			
T,K	KJ/MOL	CALCD	PCNT
85.47	23.002	23.906	-3.78
86.00	22.988	23.892	-3.78
88.00	22.938	23.837	-3.77
90.00	22.887	23.783	-3.77
95.00	22.759	23.646	-3.75
100.00	22.630	23.507	-3.73
105.00	22.499	23.366	-3.71
110.00	22.366	23.224	-3.69
115.00	22.232	23.080	-3.67
120.00	22.097	22.933	-3.65
125.00	21.960	22.785	-3.62
130.00	21.821	22.634	-3.59
135.00	21.681	22.481	-3.56
140.00	21.539	22.325	-3.52
145.00	21.396	22.167	-3.48
150.00	21.252	22.006	-3.43
155.00	21.106	21.843	-3.37
160.00	20.958	21.676	-3.31
165.00	20.808	21.506	-3.24
170.00	20.658	21.333	-3.16
175.00	20.506	21.156	-3.07
180.00	20.352	20.975	-2.97
185.00	20.197	20.791	-2.85
190.00	20.042	20.602	-2.72
195.00	19.885	20.409	-2.57
200.00	19.741	20.212	-2.33
205.00	19.578	20.009	-2.15
210.00	19.417	19.802	-1.94
215.00	19.259	19.589	-1.69
220.00	19.105	19.371	-1.37
225.00	18.954	19.146	-1.00
230.00	18.809	18.915	-.56
231.00	18.780	18.868	-.47

Table 24. Derived coexistence data ( $Q_b = 18\,780\text{ J/mol}$ ).

PROPANE ESTIM. V.P.,BAR, AND QVAP, KJ/MOL.

TB = 231.07070, PB = 1.01325, DB = .054791  
 EZB = 8303.5, EGB = 8139.7, HZB = 10224.7, HGB = 9989.0  
 SZB = 253.0943, SGB = 252.3795, QB = 18780.0

T,K	100/T	P,EQN	P,BAR	LN(P)	MOL/L	Q,EQN	Q,VAP
85.47	1.17000	.30000E-08	.16566E-08	-20.21853	.23311E-09	23.906	24.824
86.00	1.16279	.36567E-08	.20543E-08	-20.00333	.28730E-09	23.892	24.800
87.00	1.14943	.52778E-08	.30594E-08	-19.60504	.42295E-09	23.865	24.755
88.00	1.13636	.75547E-08	.45121E-08	-19.21650	.61670E-09	23.837	24.711
89.00	1.12360	.10728E-07	.65922E-08	-18.83738	.89087E-09	23.810	24.666
90.00	1.11111	.15116E-07	.95443E-08	-18.46732	.12755E-08	23.783	24.622
91.00	1.09890	.21140E-07	.13697E-07	-18.10606	.18104E-08	23.756	24.577
92.00	1.08696	.29350E-07	.19491E-07	-17.75331	.25481E-08	23.728	24.533
93.00	1.07527	.40463E-07	.27509E-07	-17.40874	.35577E-08	23.701	24.489
94.00	1.06383	.55404E-07	.38518E-07	-17.07214	.49284E-08	23.673	24.445
95.00	1.05263	.75363E-07	.53521E-07	-16.74320	.67759E-08	23.646	24.401
96.00	1.04167	.10186E-06	.73818E-07	-16.42167	.92483E-08	23.618	24.357
97.00	1.03093	.13681E-06	.10108E-06	-16.10739	.12533E-07	23.590	24.313
98.00	1.02041	.18264E-06	.13745E-06	-15.80004	.16869E-07	23.563	24.269
99.00	1.01010	.24241E-06	.18564E-06	-15.49944	.22554E-07	23.535	24.226
100.00	1.00000	.31992E-06	.24910E-06	-15.20539	.29961E-07	23.507	24.183
101.00	.99010	.41987E-06	.33216E-06	-14.91765	.39555E-07	23.479	24.139
102.00	.98039	.54809E-06	.44017E-06	-14.63610	.51903E-07	23.451	24.096
103.00	.97087	.71175E-06	.57986E-06	-14.36048	.67711E-07	23.423	24.053
104.00	.96154	.91958E-06	.75945E-06	-14.09067	.87830E-07	23.395	24.010
105.00	.95238	.11823E-05	.98912E-06	-13.82645	.11330E-06	23.366	23.967
106.00	.94340	.15127E-05	.12813E-05	-13.56767	.14538E-06	23.338	23.924
107.00	.93458	.19264E-05	.16509E-05	-13.31421	.18557E-06	23.310	23.882
108.00	.92593	.24422E-05	.21162E-05	-13.06587	.23568E-06	23.281	23.839
109.00	.91743	.30823E-05	.26993E-05	-12.82253	.29785E-06	23.252	23.797
110.00	.90909	.38735E-05	.34263E-05	-12.58403	.37463E-06	23.224	23.754
111.00	.90090	.48474E-05	.43287E-05	-12.35024	.46904E-06	23.195	23.712
112.00	.89286	.60413E-05	.54438E-05	-12.12104	.58460E-06	23.166	23.670
113.00	.88496	.74993E-05	.68157E-05	-11.89628	.72545E-06	23.137	23.628
114.00	.87719	.92731E-05	.84963E-05	-11.67588	.89639E-06	23.109	23.586
115.00	.86957	.11423E-04	.10547E-04	-11.45970	.11030E-05	23.080	23.544
116.00	.86207	.14020E-04	.13038E-04	-11.24761	.13519E-05	23.050	23.502
117.00	.85470	.17144E-04	.16054E-04	-11.03953	.16504E-05	23.021	23.460
118.00	.84746	.20892E-04	.19692E-04	-10.83531	.20071E-05	22.992	23.419
119.00	.84034	.25371E-04	.24061E-04	-10.63491	.24319E-05	22.963	23.377
120.00	.83333	.30708E-04	.29292E-04	-10.43820	.29359E-05	22.933	23.335
121.00	.82645	.37046E-04	.35532E-04	-10.24507	.35320E-05	22.904	23.294
122.00	.81967	.44550E-04	.42951E-04	-10.05545	.42344E-05	22.874	23.253
123.00	.81301	.53407E-04	.51743E-04	-9.86923	.50597E-05	22.844	23.211
124.00	.80645	.63830E-04	.62125E-04	-9.68635	.60260E-05	22.815	23.170
125.00	.80000	.76061E-04	.74352E-04	-9.50670	.71543E-05	22.785	23.129
126.00	.79365	.90372E-04	.88700E-04	-9.33025	.84672E-05	22.755	23.088
127.00	.78740	.10707E-03	.10550E-03	-9.15684	.99912E-05	22.725	23.047
128.00	.78125	.12650E-03	.12509E-03	-8.98647	.11755E-04	22.695	23.006
129.00	.77519	.14906E-03	.14789E-03	-8.81904	.13789E-04	22.664	22.965
130.00	.76923	.17517E-03	.17435E-03	-8.65446	.16131E-04	22.634	22.925
131.00	.76336	.20532E-03	.20496E-03	-8.49270	.18819E-04	22.604	22.884
132.00	.75758	.24005E-03	.24029E-03	-8.33367	.21896E-04	22.573	22.843
133.00	.75188	.27996E-03	.28096E-03	-8.17731	.25409E-04	22.542	22.803

Table 24. Continued.

## PROPANE ESTIM. V.P., BAR, AND QVAP, KJ/MOL.

TB = 231.07070, PB = 1.01325, DB = .054791  
 EZB = 8303.5, EGB = 8139.7, HZB = 10224.7, HGB = 9989.0  
 SZB = 253.0943, SGB = 252.3795, QP = 18780.0

T,K	100/T	P,EQN	P,BAR	LN(P)	MOL/L	Q,EQN	Q,VAP
134.00	.74627	.32572E-03	.32766E-03	-8.02354	.29412E-04	22.512	22.762
135.00	.74074	.37805E-03	.38114E-03	-7.87234	.33960E-04	22.481	22.722
136.00	.73529	.43777E-03	.44227E-03	-7.72359	.39117E-04	22.450	22.681
137.00	.72993	.50577E-03	.51194E-03	-7.57730	.44949E-04	22.419	22.641
138.00	.72464	.58303E-03	.59120E-03	-7.43336	.51532E-04	22.388	22.601
139.00	.71942	.67063E-03	.68113E-03	-7.29176	.58945E-04	22.357	22.560
140.00	.71429	.76974E-03	.78294E-03	-7.15245	.67273E-04	22.325	22.520
141.00	.70922	.88165E-03	.89801E-03	-7.01533	.76614E-04	22.294	22.480
142.00	.70423	.10078E-02	.10278E-02	-6.88037	.87068E-04	22.262	22.440
143.00	.69930	.11496E-02	.11738E-02	-6.74755	.98743E-04	22.231	22.400
144.00	.69444	.13088E-02	.13377E-02	-6.61682	.11176E-03	22.199	22.360
145.00	.68966	.14873E-02	.15214E-02	-6.48810	.12623E-03	22.167	22.320
146.00	.68493	.16868E-02	.17270E-02	-6.36136	.14231E-03	22.135	22.280
147.00	.68027	.19096E-02	.19566E-02	-6.23657	.16014E-03	22.103	22.240
148.00	.67568	.21579E-02	.22123E-02	-6.11371	.17985E-03	22.071	22.200
149.00	.67114	.24341E-02	.24970E-02	-5.99266	.20164E-03	22.039	22.161
150.00	.66667	.27409E-02	.28131E-02	-5.87347	.22566E-03	22.006	22.121
151.00	.66225	.30811E-02	.31636E-02	-5.75605	.25210E-03	21.974	22.081
152.00	.65789	.34577E-02	.35514E-02	-5.64040	.28116E-03	21.941	22.042
153.00	.65359	.38740E-02	.39802E-02	-5.52643	.31306E-03	21.908	22.002
154.00	.64935	.43334E-02	.44531E-02	-5.41416	.34800E-03	21.876	21.962
155.00	.64516	.48396E-02	.49740E-02	-5.30353	.38623E-03	21.843	21.923
156.00	.64103	.53966E-02	.55471E-02	-5.19448	.42799E-03	21.809	21.883
157.00	.63694	.60084E-02	.61762E-02	-5.08705	.47353E-03	21.776	21.844
158.00	.63291	.66797E-02	.68662E-02	-4.98114	.52314E-03	21.743	21.804
159.00	.62893	.74151E-02	.76219E-02	-4.87673	.57711E-03	21.709	21.765
160.00	.62500	.82195E-02	.84481E-02	-4.77382	.63571E-03	21.676	21.725
161.00	.62112	.90984E-02	.93500E-02	-4.67238	.69928E-03	21.642	21.686
162.00	.61728	.10057E-01	.10334E-01	-4.57233	.76816E-03	21.608	21.646
163.00	.61350	.11102E-01	.11405E-01	-4.47370	.84267E-03	21.574	21.607
164.00	.60976	.12239E-01	.12570E-01	-4.37643	.92318E-03	21.540	21.567
165.00	.60606	.13475E-01	.13836E-01	-4.28051	.10101E-02	21.506	21.528
166.00	.60241	.14816E-01	.15208E-01	-4.18591	.11037E-02	21.471	21.488
167.00	.59880	.16271E-01	.16696E-01	-4.09261	.12046E-02	21.437	21.449
168.00	.59524	.17846E-01	.18305E-01	-4.00057	.13130E-02	21.402	21.410
169.00	.59172	.19549E-01	.20045E-01	-3.90976	.14295E-02	21.367	21.370
170.00	.58824	.21389E-01	.21924E-01	-3.82018	.15545E-02	21.333	21.331
171.00	.58480	.23375E-01	.23950E-01	-3.73181	.16885E-02	21.297	21.291
172.00	.58140	.25516E-01	.26132E-01	-3.64459	.18319E-02	21.262	21.252
173.00	.57803	.27821E-01	.28480E-01	-3.55854	.19854E-02	21.227	21.212
174.00	.57471	.30301E-01	.31005E-01	-3.47361	.21493E-02	21.191	21.173
175.00	.57143	.32966E-01	.33715E-01	-3.38981	.23243E-02	21.156	21.133
176.00	.56818	.35826E-01	.36623E-01	-3.30708	.25109E-02	21.120	21.094
177.00	.56497	.38893E-01	.39739E-01	-3.22542	.27097E-02	21.084	21.054
178.00	.56180	.42178E-01	.43074E-01	-3.14483	.29213E-02	21.048	21.014
179.00	.55866	.45695E-01	.46642E-01	-3.06526	.31463E-02	21.012	20.975
180.00	.55556	.49454E-01	.50454E-01	-2.98670	.33853E-02	20.975	20.935
181.00	.55249	.53470E-01	.54523E-01	-2.90913	.36391E-02	20.939	20.895
182.00	.54945	.57756E-01	.58862E-01	-2.83257	.39081E-02	20.902	20.856



Table 24. Continued.

## PROPANE ESTIM. V.P., BAR, AND QVAP, KJ/MOL.

TB = 231.07070, PB = 1.01325, DB = .054791  
 EZB = 8303.5, EGB = 8139.7, HZB = 10224.7, HGB = 9989.0  
 SZB = 253.0943, SGB = 252.3795, QB = 18780.0

T,K	100/T	P,EQN	P,BAR	LN(P)	MOL/L	Q,EQN	Q,VAP
183.00	.54645	.62326E-01	.63487E-01	-2.75693	.41933E-02	20.865	20.816
184.00	.54348	.67195E-01	.68409E-01	-2.68226	.44951E-02	20.828	20.776
185.00	.54054	.72376E-01	.73646E-01	-2.60848	.48146E-02	20.791	20.736
186.00	.53763	.77886E-01	.79210E-01	-2.53565	.51521E-02	20.753	20.696
187.00	.53476	.83741E-01	.85121E-01	-2.46368	.55088E-02	20.716	20.656
188.00	.53191	.89957E-01	.91390E-01	-2.39262	.58850E-02	20.678	20.616
189.00	.52910	.96551E-01	.98039E-01	-2.32239	.62820E-02	20.640	20.576
190.00	.52632	.10354E+00	.10508E+00	-2.25301	.67003E-02	20.602	20.536
191.00	.52356	.11094E+00	.11253E+00	-2.18450	.71406E-02	20.564	20.495
192.00	.52083	.11878E+00	.12042E+00	-2.11679	.76041E-02	20.525	20.455
193.00	.51813	.12706E+00	.12875E+00	-2.04988	.80915E-02	20.487	20.415
194.00	.51546	.13581E+00	.13755E+00	-1.98374	.86039E-02	20.448	20.374
195.00	.51282	.14506E+00	.14684E+00	-1.91841	.91417E-02	20.409	20.334
196.00	.51020	.15481E+00	.15664E+00	-1.85382	.97063E-02	20.370	20.293
197.00	.50761	.16509E+00	.16696E+00	-1.78999	.10298E-01	20.331	20.252
198.00	.50505	.17593E+00	.17783E+00	-1.72690	.10919E-01	20.291	20.211
199.00	.50251	.18734E+00	.18928E+00	-1.66455	.11569E-01	20.252	20.170
200.00	.50000	.19934E+00	.20131E+00	-1.60289	.12250E-01	20.212	20.129
201.00	.49751	.21197E+00	.21396E+00	-1.54195	.12962E-01	20.172	20.088
202.00	.49505	.22523E+00	.22725E+00	-1.48170	.13706E-01	20.131	20.047
203.00	.49261	.23916E+00	.24120E+00	-1.42213	.14484E-01	20.091	20.005
204.00	.49020	.25378E+00	.25584E+00	-1.36322	.15297E-01	20.050	19.964
205.00	.48780	.26912E+00	.27118E+00	-1.30497	.16145E-01	20.009	19.922
206.00	.48544	.28519E+00	.28727E+00	-1.24735	.17030E-01	19.968	19.880
207.00	.48309	.30203E+00	.30410E+00	-1.19040	.17953E-01	19.927	19.838
208.00	.48077	.31967E+00	.32173E+00	-1.13406	.18915E-01	19.886	19.796
209.00	.47847	.33812E+00	.34017E+00	-1.07831	.19917E-01	19.844	19.754
210.00	.47619	.35741E+00	.35944E+00	-1.02321	.20960E-01	19.802	19.712
211.00	.47393	.37758E+00	.37958E+00	-.96868	.22046E-01	19.760	19.669
212.00	.47170	.39865E+00	.40062E+00	-.91475	.23175E-01	19.718	19.627
213.00	.46948	.42064E+00	.42258E+00	-.86138	.24350E-01	19.675	19.584
214.00	.46729	.44359E+00	.44549E+00	-.80858	.25570E-01	19.632	19.541
215.00	.46512	.46753E+00	.46937E+00	-.75636	.26838E-01	19.589	19.498
216.00	.46296	.49249E+00	.49428E+00	-.70466	.28155E-01	19.546	19.455
217.00	.46083	.51849E+00	.52021E+00	-.65352	.29521E-01	19.502	19.411
218.00	.45872	.54557E+00	.54721E+00	-.60291	.30938E-01	19.459	19.368
219.00	.45662	.57375E+00	.57531E+00	-.55285	.32407E-01	19.415	19.324
220.00	.45455	.60307E+00	.60455E+00	-.50328	.33931E-01	19.371	19.280
221.00	.45249	.63357E+00	.63494E+00	-.45423	.35509E-01	19.326	19.236
222.00	.45045	.66526E+00	.66654E+00	-.40565	.37144E-01	19.282	19.192
223.00	.44843	.69819E+00	.69936E+00	-.35758	.38837E-01	19.237	19.147
224.00	.44643	.73239E+00	.73344E+00	-.31001	.40589E-01	19.192	19.102
225.00	.44444	.76789E+00	.76880E+00	-.26292	.42401E-01	19.146	19.057
226.00	.44248	.80472E+00	.80550E+00	-.21629	.44276E-01	19.101	19.012
227.00	.44053	.84292E+00	.84356E+00	-.17012	.46215E-01	19.055	18.967
228.00	.43860	.88252E+00	.88303E+00	-.12440	.48219E-01	19.008	18.921
229.00	.43668	.92356E+00	.92389E+00	-.07916	.50287E-01	18.962	18.876
230.00	.43478	.96607E+00	.96624E+00	-.03434	.52425E-01	18.915	18.830
231.00	.43290	.10101E+01	.10101E+01	.01003	.54632E-01	18.868	18.783



Table 25. Derived coexistence data ( $Q_b = 18\,864\text{ J/mol}$ ).

PROPANE ESTIM. V.P.,BAR, AND QVAP, KJ/MOL.

TB = 231.07070, PB = 1.01325, DB = .054791  
 EZB = 8303.5, EGB = 8139.7, HZB = 10224.7, HGB = 9989.0  
 SZB = 253.0943, SGB = 252.3795, QB = 18864.0

T,K	100/T	P,EQN	P,BAR	LN(P)	MOL/L	Q,EQN	Q,VAP
85.47	1.17000	.30000E-08	.15376E-08	-20.29302	.21638E-09	23.906	24.908
86.00	1.16279	.36567E-08	.19082E-08	-20.07709	.26687E-09	23.892	24.884
87.00	1.14943	.52778E-08	.28457E-08	-19.67746	.39340E-09	23.865	24.839
88.00	1.13636	.75547E-08	.42025E-08	-19.28759	.57438E-09	23.837	24.795
89.00	1.12360	.10728E-07	.61480E-08	-18.90715	.83083E-09	23.810	24.750
90.00	1.11111	.15116E-07	.89123E-08	-18.53583	.11910E-08	23.783	24.706
91.00	1.09890	.21140E-07	.12806E-07	-18.17337	.16925E-08	23.756	24.661
92.00	1.08696	.29350E-07	.18244E-07	-17.81942	.23851E-08	23.728	24.617
93.00	1.07527	.40463E-07	.25781E-07	-17.47364	.33341E-08	23.701	24.573
94.00	1.06383	.55404E-07	.36139E-07	-17.13589	.46241E-08	23.673	24.529
95.00	1.05263	.75363E-07	.50273E-07	-16.80579	.63648E-08	23.646	24.485
96.00	1.04167	.10186E-06	.69413E-07	-16.48319	.86964E-08	23.618	24.441
97.00	1.03093	.13681E-06	.95152E-07	-16.16779	.11798E-07	23.590	24.397
98.00	1.02041	.18264E-06	.12953E-06	-15.85939	.15896E-07	23.563	24.353
99.00	1.01010	.24241E-06	.17512E-06	-15.55778	.21275E-07	23.535	24.310
100.00	1.00000	.31992E-06	.23523E-06	-15.26270	.28292E-07	23.507	24.267
101.00	.99010	.41987E-06	.31397E-06	-14.97398	.37388E-07	23.479	24.223
102.00	.98039	.54809E-06	.41649E-06	-14.69141	.49111E-07	23.451	24.180
103.00	.97087	.71175E-06	.54917E-06	-14.41486	.64127E-07	23.423	24.137
104.00	.96154	.91958E-06	.71994E-06	-14.14410	.83260E-07	23.395	24.094
105.00	.95238	.11823E-05	.93854E-06	-13.87894	.10751E-06	23.366	24.051
106.00	.94340	.15127E-05	.12168E-05	-13.61927	.13807E-06	23.338	24.008
107.00	.93458	.19264E-05	.15693E-05	-13.36491	.17639E-06	23.310	23.966
108.00	.92593	.24422E-05	.20134E-05	-13.11569	.22422E-06	23.281	23.923
109.00	.91743	.30823E-05	.25703E-05	-12.87148	.28362E-06	23.252	23.881
110.00	.90909	.38735E-05	.32653E-05	-12.63216	.35703E-06	23.224	23.838
111.00	.90090	.48474E-05	.41287E-05	-12.39754	.44737E-06	23.195	23.796
112.00	.89286	.60413E-05	.51965E-05	-12.16752	.55805E-06	23.166	23.754
113.00	.88496	.74993E-05	.65113E-05	-11.94197	.69305E-06	23.137	23.712
114.00	.87719	.92731E-05	.81233E-05	-11.72077	.85704E-06	23.109	23.670
115.00	.86957	.11423E-04	.10091E-04	-11.50383	.10554E-05	23.080	23.628
116.00	.86207	.14020E-04	.12485E-04	-11.29100	.12945E-05	23.050	23.586
117.00	.85470	.17144E-04	.15385E-04	-11.08214	.15815E-05	23.021	23.544
118.00	.84746	.20892E-04	.18883E-04	-10.87723	.19247E-05	22.992	23.503
119.00	.84034	.25371E-04	.23091E-04	-10.67607	.23338E-05	22.963	23.461
120.00	.83333	.30708E-04	.28131E-04	-10.47864	.28195E-05	22.933	23.419
121.00	.82645	.37046E-04	.34147E-04	-10.28483	.33943E-05	22.904	23.378
122.00	.81967	.44550E-04	.41305E-04	-10.09454	.40721E-05	22.874	23.337
123.00	.81301	.53407E-04	.49793E-04	-9.90763	.48691E-05	22.844	23.295
124.00	.80645	.63830E-04	.59825E-04	-9.72409	.58028E-05	22.815	23.254
125.00	.80000	.76061E-04	.71643E-04	-9.54381	.68936E-05	22.785	23.213
126.00	.79365	.90372E-04	.85526E-04	-9.36669	.81641E-05	22.755	23.172
127.00	.78740	.10707E-03	.10178E-03	-9.19269	.96393E-05	22.725	23.131
128.00	.78125	.12650E-03	.12076E-03	-9.02168	.11348E-04	22.695	23.090
129.00	.77519	.14906E-03	.14286E-03	-8.85365	.13320E-04	22.664	23.049
130.00	.76923	.17517E-03	.16852E-03	-8.68848	.15591E-04	22.634	23.009
131.00	.76336	.20532E-03	.19822E-03	-8.52612	.18200E-04	22.604	22.968
132.00	.75758	.24005E-03	.23253E-03	-8.36649	.21189E-04	22.573	22.927
133.00	.75188	.27996E-03	.27204E-03	-8.20955	.24603E-04	22.542	22.887

Table 25. Continued.

## PROPANE ESTIM. V.P., BAR, AND QVAP, KJ/MOL.

TB = 231.07070, PB = 1.01325, DB = .054791

EZB = 8303.5, EGB = 8139.7, HZB = 10224.7, HGB = 9989.0

SZB = 253.0943, SGB = 252.3795, QB = 18864.0

T, K	100/T	P, EQN	P, BAR	LN(P)	MOL/L	Q, EQN	Q, VAP
134.00	.74627	.32572E-03	.31744E-03	-8.05523	.28494E-04	22.512	22.846
135.00	.74074	.37805E-03	.36947E-03	-7.90345	.32919E-04	22.481	22.806
136.00	.73529	.43777E-03	.42895E-03	-7.75417	.37939E-04	22.450	22.765
137.00	.72993	.50577E-03	.49680E-03	-7.60732	.43619E-04	22.419	22.725
138.00	.72464	.58303E-03	.57401E-03	-7.46287	.50034E-04	22.388	22.685
139.00	.71942	.67063E-03	.66166E-03	-7.32075	.57260E-04	22.357	22.644
140.00	.71429	.76974E-03	.76100E-03	-7.18088	.65388E-04	22.325	22.604
141.00	.70922	.88165E-03	.87329E-03	-7.04325	.74504E-04	22.294	22.564
142.00	.70423	.10078E-02	.99996E-03	-6.90780	.84712E-04	22.262	22.524
143.00	.69930	.11496E-02	.11426E-02	-6.77448	.96118E-04	22.231	22.484
144.00	.69444	.13088E-02	.13028E-02	-6.64326	.10884E-03	22.199	22.444
145.00	.68966	.14873E-02	.14825E-02	-6.51406	.12300E-03	22.167	22.404
146.00	.68493	.16868E-02	.16836E-02	-6.38684	.13873E-03	22.135	22.364
147.00	.68027	.19096E-02	.19082E-02	-6.26160	.15618E-03	22.103	22.324
148.00	.67568	.21579E-02	.21587E-02	-6.13823	.17549E-03	22.071	22.284
149.00	.67114	.24341E-02	.24375E-02	-6.01677	.19683E-03	22.039	22.245
150.00	.66667	.27409E-02	.27474E-02	-5.89712	.22038E-03	22.006	22.205
151.00	.66225	.30811E-02	.30910E-02	-5.77927	.24632E-03	21.974	22.165
152.00	.65789	.34577E-02	.34716E-02	-5.66315	.27484E-03	21.941	22.126
153.00	.65359	.38740E-02	.38923E-02	-5.54875	.30615E-03	21.908	22.086
154.00	.64935	.43334E-02	.43567E-02	-5.43605	.34047E-03	21.876	22.046
155.00	.64516	.48396E-02	.48684E-02	-5.32499	.37802E-03	21.843	22.007
156.00	.64103	.53966E-02	.54315E-02	-5.21555	.41907E-03	21.809	21.967
157.00	.63694	.60084E-02	.60501E-02	-5.10769	.46385E-03	21.776	21.928
158.00	.63291	.66797E-02	.67288E-02	-5.00135	.51266E-03	21.743	21.888
159.00	.62893	.74151E-02	.74721E-02	-4.89658	.56575E-03	21.709	21.849
160.00	.62500	.82195E-02	.82853E-02	-4.79328	.62345E-03	21.676	21.809
161.00	.62112	.90984E-02	.91737E-02	-4.69142	.68607E-03	21.642	21.770
162.00	.61728	.10057E-01	.10143E-01	-4.59100	.75393E-03	21.608	21.730
163.00	.61350	.11102E-01	.11198E-01	-4.49198	.82738E-03	21.574	21.691
164.00	.60976	.12239E-01	.12347E-01	-4.39433	.90678E-03	21.540	21.651
165.00	.60606	.13475E-01	.13595E-01	-4.29805	.99248E-03	21.506	21.612
166.00	.60241	.14816E-01	.14949E-01	-4.20309	.10849E-02	21.471	21.573
167.00	.59880	.16271E-01	.16418E-01	-4.10940	.11845E-02	21.437	21.533
168.00	.59524	.17846E-01	.18007E-01	-4.01701	.12916E-02	21.402	21.494
169.00	.59172	.19549E-01	.19726E-01	-3.92584	.14067E-02	21.367	21.454
170.00	.58824	.21389E-01	.21581E-01	-3.83593	.15302E-02	21.333	21.415
171.00	.58480	.23375E-01	.23584E-01	-3.74720	.16626E-02	21.297	21.375
172.00	.58140	.25516E-01	.25741E-01	-3.65966	.18045E-02	21.262	21.336
173.00	.57803	.27821E-01	.28064E-01	-3.57326	.19563E-02	21.227	21.296
174.00	.57471	.30301E-01	.30562E-01	-3.48800	.21185E-02	21.191	21.257
175.00	.57143	.32966E-01	.33244E-01	-3.40387	.22917E-02	21.156	21.217
176.00	.56818	.35826E-01	.36123E-01	-3.32082	.24765E-02	21.120	21.178
177.00	.56497	.38893E-01	.39210E-01	-3.23883	.26735E-02	21.084	21.138
178.00	.56180	.42178E-01	.42514E-01	-3.15791	.28832E-02	21.048	21.099
179.00	.55866	.45695E-01	.46050E-01	-3.07802	.31062E-02	21.012	21.059
180.00	.55556	.49454E-01	.49829E-01	-2.99916	.33432E-02	20.975	21.019
181.00	.55249	.53470E-01	.53864E-01	-2.92130	.35949E-02	20.939	20.980
182.00	.54945	.57756E-01	.58169E-01	-2.84440	.38619E-02	20.902	20.940

Table 25. Continued.

## PROPANE ESTIM. V.P., BAR, AND QVAP, KJ/MOL.

TB = 231.07070, PB = 1.01325, DB = .054791  
 EZB = 8303.5, EGB = 8139.7, HZB = 10224.7, HGB = 9989.0  
 SZB = 253.0943, SGB = 252.3795, QB = 18864.0

T,K	100/T	P,EQN	P,BAR	LN(P)	MOL/L	Q,EQN	Q,VAP
183.00	.54645	.62326E-01	.62758E-01	-2.76847	.41450E-02	20.865	20.900
184.00	.54348	.67195E-01	.67644E-01	-2.69350	.44446E-02	20.828	20.860
185.00	.54054	.72376E-01	.72844E-01	-2.61943	.47619E-02	20.791	20.820
186.00	.53763	.77886E-01	.78371E-01	-2.54630	.50972E-02	20.753	20.780
187.00	.53476	.83741E-01	.84242E-01	-2.47406	.54516E-02	20.716	20.740
188.00	.53191	.89957E-01	.90473E-01	-2.40270	.58256E-02	20.678	20.700
189.00	.52910	.96551E-01	.97082E-01	-2.33220	.62202E-02	20.640	20.660
190.00	.52632	.10354E+00	.10408E+00	-2.26256	.66362E-02	20.602	20.620
191.00	.52356	.11094E+00	.11150E+00	-2.19372	.70746E-02	20.564	20.580
192.00	.52083	.11878E+00	.11935E+00	-2.12574	.75358E-02	20.525	20.539
193.00	.51813	.12706E+00	.12764E+00	-2.05856	.80210E-02	20.487	20.499
194.00	.51546	.13581E+00	.13640E+00	-1.99218	.85309E-02	20.448	20.459
195.00	.51282	.14506E+00	.14565E+00	-1.92658	.90666E-02	20.409	20.418
196.00	.51020	.15481E+00	.15540E+00	-1.86172	.96291E-02	20.370	20.377
197.00	.50761	.16509E+00	.16569E+00	-1.79762	.10219E-01	20.331	20.337
198.00	.50505	.17593E+00	.17652E+00	-1.73430	.10838E-01	20.291	20.296
199.00	.50251	.18734E+00	.18793E+00	-1.67168	.11486E-01	20.252	20.255
200.00	.50000	.19934E+00	.19993E+00	-1.60978	.12165E-01	20.212	20.214
201.00	.49751	.21197E+00	.21255E+00	-1.54856	.12875E-01	20.172	20.172
202.00	.49505	.22523E+00	.22581E+00	-1.48807	.13618E-01	20.131	20.131
203.00	.49261	.23916E+00	.23973E+00	-1.42824	.14395E-01	20.091	20.090
204.00	.49020	.25378E+00	.25433E+00	-1.36911	.15206E-01	20.050	20.048
205.00	.48780	.26912E+00	.26965E+00	-1.31062	.16053E-01	20.009	20.007
206.00	.48544	.28519E+00	.28572E+00	-1.25276	.16937E-01	19.968	19.965
207.00	.48309	.30203E+00	.30253E+00	-1.19557	.17859E-01	19.927	19.923
208.00	.48077	.31967E+00	.32014E+00	-1.13898	.18820E-01	19.886	19.881
209.00	.47847	.33812E+00	.33857E+00	-1.08302	.19822E-01	19.844	19.839
210.00	.47619	.35741E+00	.35784E+00	-1.02768	.20865E-01	19.802	19.796
211.00	.47393	.37758E+00	.37798E+00	-.97291	.21951E-01	19.760	19.754
212.00	.47170	.39865E+00	.39901E+00	-.91877	.23081E-01	19.718	19.711
213.00	.46948	.42064E+00	.42099E+00	-.86515	.24256E-01	19.675	19.669
214.00	.46729	.44359E+00	.44390E+00	-.81215	.25478E-01	19.632	19.626
215.00	.46512	.46753E+00	.46780E+00	-.75971	.26746E-01	19.589	19.583
216.00	.46296	.49249E+00	.49273E+00	-.70780	.28064E-01	19.546	19.539
217.00	.46083	.51849E+00	.51869E+00	-.65644	.29433E-01	19.502	19.496
218.00	.45872	.54557E+00	.54575E+00	-.60560	.30853E-01	19.459	19.452
219.00	.45662	.57375E+00	.57389E+00	-.55532	.32325E-01	19.415	19.408
220.00	.45455	.60307E+00	.60318E+00	-.50553	.33852E-01	19.371	19.364
221.00	.45249	.63317E+00	.63364E+00	-.45627	.35434E-01	19.326	19.320
222.00	.45045	.66526E+00	.66532E+00	-.40748	.37074E-01	19.282	19.276
223.00	.44843	.69819E+00	.69821E+00	-.35923	.38772E-01	19.237	19.231
224.00	.44643	.73239E+00	.73239E+00	-.31144	.40529E-01	19.192	19.187
225.00	.44444	.76789E+00	.76786E+00	-.26414	.42348E-01	19.146	19.142
226.00	.44248	.80472E+00	.80469E+00	-.21729	.44230E-01	19.101	19.096
227.00	.44053	.84292E+00	.84289E+00	-.17092	.46177E-01	19.055	19.051
228.00	.43860	.88252E+00	.88249E+00	-.12501	.48188E-01	19.008	19.005
229.00	.43668	.92356E+00	.92353E+00	-.07955	.50267E-01	18.962	18.960
230.00	.43478	.96607E+00	.96604E+00	-.03455	.52413E-01	18.915	18.914
231.00	.43290	.10101E+01	.10101E+01	.01003	.54632E-01	18.868	18.867



TABLE 26. Calculated P(T) isochores

The following pages give P(T) along isochores, as computed by the equation of state. The third column DP/DD is the isotherm slope ( $\partial P/\partial \rho$ ) in units of the bar and mol/L. The last two columns give the isochore slopes and curvatures  $\partial P/\partial T$ ,  $\partial^2 T/\partial T^2$ , in units of the bar and K.

These tables show that the isochore curvatures are qualitatively consistent with a maximum in the specific heat  $C_v(\rho, T)$  at the critical point.

Table 26. Calculated P(T) isochores.

THE ISOCHORE AT 1.00 MOL/L				
T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
334.0	19.866	12.573	.1148	-.00034
342.0	20.774	13.758	.1125	-.00025
350.0	21.667	14.893	.1107	-.00021
358.0	22.546	15.995	.1092	-.00017
366.0	23.414	17.070	.1079	-.00015
374.0	24.272	18.124	.1068	-.00013
382.0	25.122	19.160	.1058	-.00012
390.0	25.965	20.180	.1049	-.00010
398.0	26.800	21.187	.1041	-.00009
406.0	27.630	22.182	.1034	-.00009
414.0	28.455	23.165	.1027	-.00008
422.0	29.274	24.139	.1021	-.00007
430.0	30.089	25.104	.1016	-.00007
438.0	30.899	26.061	.1010	-.00006
446.0	31.705	27.011	.1006	-.00006
454.0	32.508	27.953	.1001	-.00005
462.0	33.307	28.889	.0997	-.00005
470.0	34.103	29.820	.0993	-.00005
478.0	34.896	30.744	.0990	-.00004
486.0	35.687	31.664	.0986	-.00004
494.0	36.474	32.579	.0983	-.00004
502.0	37.259	33.489	.0980	-.00004
510.0	38.042	34.395	.0977	-.00003
518.0	38.822	35.296	.0974	-.00003
526.0	39.601	36.194	.0972	-.00003
534.0	40.377	37.089	.0969	-.00003
542.0	41.152	37.980	.0967	-.00003
550.0	41.924	38.868	.0965	-.00003
558.0	42.695	39.752	.0963	-.00003
566.0	43.464	40.634	.0961	-.00002
574.0	44.232	41.513	.0959	-.00002
582.0	44.998	42.389	.0957	-.00002
590.0	45.763	43.263	.0955	-.00002
598.0	46.527	44.134	.0953	-.00002



Table 26. Continued.

THE ISOCHORE AT 2.00 MOL/L				
T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
358.0	33.146	5.853	.2721	-.00139
366.0	35.286	7.320	.2637	-.00083
374.0	37.372	8.700	.2580	-.00061
382.0	39.418	10.035	.2537	-.00048
390.0	41.434	11.338	.2502	-.00040
398.0	43.423	12.619	.2472	-.00035
406.0	45.390	13.881	.2446	-.00030
414.0	47.337	15.127	.2423	-.00027
422.0	49.267	16.361	.2402	-.00024
430.0	51.181	17.583	.2384	-.00022
438.0	53.081	18.795	.2367	-.00020
446.0	54.969	19.998	.2351	-.00019
454.0	56.844	21.192	.2337	-.00017
462.0	58.708	22.380	.2324	-.00016
470.0	60.563	23.560	.2312	-.00015
478.0	62.408	24.734	.2300	-.00014
486.0	64.244	25.903	.2290	-.00013
494.0	66.072	27.066	.2280	-.00012
502.0	67.892	28.223	.2271	-.00011
510.0	69.705	29.377	.2262	-.00011
518.0	71.511	30.525	.2254	-.00010
526.0	73.311	31.670	.2246	-.00010
534.0	75.104	32.811	.2238	-.00009
542.0	76.892	33.947	.2231	-.00009
550.0	78.674	35.081	.2225	-.00008
558.0	80.452	36.211	.2218	-.00008
566.0	82.224	37.337	.2212	-.00007
574.0	83.991	38.461	.2207	-.00007
582.0	85.754	39.582	.2201	-.00007
590.0	87.513	40.700	.2196	-.00006
598.0	89.268	41.815	.2191	-.00006

Table 26. Continued.

THE ISOCHORE AT 3.00 MOL/L				
T, K	P, BAR	OP/00	OP/01	02P/012
366.0	39.461	1.694	.4599	-.00585
374.0	43.034	3.273	.4382	-.00154
382.0	46.498	4.744	.4286	-.00096
390.0	49.899	6.190	.4220	-.00071
398.0	53.254	7.624	.4169	-.00057
406.0	56.572	9.050	.4127	-.00048
414.0	59.859	10.472	.4091	-.00042
422.0	63.119	11.890	.4060	-.00037
430.0	66.355	13.305	.4032	-.00033
438.0	69.570	14.717	.4007	-.00030
446.0	72.766	16.128	.3984	-.00027
454.0	75.945	17.537	.3963	-.00025
462.0	79.107	18.944	.3944	-.00023
470.0	82.255	20.350	.3926	-.00021
478.0	85.390	21.755	.3910	-.00020
486.0	88.511	23.158	.3894	-.00019
494.0	91.621	24.560	.3880	-.00017
502.0	94.720	25.960	.3867	-.00016
510.0	97.808	27.360	.3854	-.00015
518.0	100.886	28.758	.3842	-.00015
526.0	103.955	30.155	.3831	-.00014
534.0	107.015	31.551	.3820	-.00013
542.0	110.067	32.946	.3810	-.00012
550.0	113.111	34.340	.3800	-.00012
558.0	116.147	35.733	.3791	-.00011
566.0	119.176	37.125	.3782	-.00011
574.0	122.198	38.515	.3773	-.00010
582.0	125.214	39.905	.3765	-.00010
590.0	128.223	41.293	.3757	-.00010
598.0	131.226	42.681	.3750	-.00009

Table 26. Continued.

THE ISOCHORE AT 4.00 MOL/L				
T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
374.0	44.999	1.082	.6245	-.000210
382.0	49.947	2.578	.6139	-.000092
390.0	54.832	4.109	.6079	-.000062
398.0	59.677	5.665	.6036	-.000048
406.0	64.492	7.242	.6001	-.000040
414.0	69.280	8.835	.5972	-.000034
422.0	74.047	10.442	.5946	-.000030
430.0	78.795	12.062	.5924	-.000027
438.0	83.526	13.691	.5903	-.000024
446.0	88.241	15.331	.5885	-.000022
454.0	92.942	16.978	.5868	-.000020
462.0	97.630	18.633	.5852	-.000019
470.0	102.305	20.295	.5837	-.000018
478.0	106.970	21.962	.5824	-.000017
486.0	111.623	23.635	.5811	-.000016
494.0	116.267	25.313	.5799	-.000015
502.0	120.901	26.995	.5787	-.000014
510.0	125.526	28.681	.5776	-.000013
518.0	130.143	30.371	.5765	-.000013
526.0	134.751	32.064	.5755	-.000012
534.0	139.351	33.760	.5746	-.000012
542.0	143.944	35.459	.5736	-.000011
550.0	148.529	37.160	.5727	-.000011
558.0	153.108	38.863	.5719	-.000011
566.0	157.679	40.568	.5710	-.000010
574.0	162.244	42.275	.5702	-.000010
582.0	166.803	43.984	.5694	-.000010
590.0	171.355	45.694	.5687	-.000009
598.0	175.902	47.406	.5679	-.000009

Table 26. Continued.

THE ISOCHORE AT 4.96 MOL/L				
T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
374.0	45.805	.790	.8059	-.00000
382.0	52.253	2.465	.8059	-.00001
390.0	58.699	4.225	.8058	-.00001
398.0	65.145	6.038	.8057	-.00002
406.0	71.590	7.890	.8055	-.00002
414.0	78.034	9.774	.8053	-.00003
422.0	84.475	11.685	.8051	-.00003
430.0	90.915	13.618	.8049	-.00003
438.0	97.353	15.571	.8046	-.00003
446.0	103.789	17.541	.8043	-.00004
454.0	110.222	19.527	.8040	-.00004
462.0	116.653	21.527	.8037	-.00004
470.0	123.081	23.539	.8033	-.00004
478.0	129.506	25.562	.8030	-.00005
486.0	135.928	27.595	.8026	-.00005
494.0	142.347	29.638	.8022	-.00005
502.0	148.763	31.688	.8018	-.00005
510.0	155.176	33.747	.8014	-.00005
518.0	161.585	35.812	.8009	-.00005
526.0	167.991	37.884	.8005	-.00006
534.0	174.393	39.961	.8001	-.00006
542.0	180.792	42.044	.7996	-.00006
550.0	187.187	44.131	.7991	-.00006
558.0	193.578	46.223	.7987	-.00006
566.0	199.965	48.319	.7982	-.00006
574.0	206.349	50.419	.7977	-.00006
582.0	212.729	52.522	.7972	-.00006
590.0	219.104	54.628	.7967	-.00006
598.0	225.476	56.737	.7962	-.00006

Table 26. Continued.

THE ISOCHORE AT 6.00 MOL/L				
T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
374.0	46.924	1.729	1.0484	.00301
382.0	55.381	4.015	1.0636	.00131
390.0	63.926	6.371	1.0721	.00087
398.0	72.528	8.777	1.0781	.00065
406.0	81.172	11.221	1.0828	.00052
414.0	89.850	13.697	1.0865	.00043
422.0	98.555	16.199	1.0897	.00036
430.0	107.284	18.724	1.0924	.00031
438.0	116.032	21.269	1.0947	.00026
446.0	124.797	23.832	1.0966	.00023
454.0	133.577	26.410	1.0983	.00020
462.0	142.370	29.002	1.0998	.00017
470.0	151.173	31.606	1.1010	.00015
478.0	159.986	34.222	1.1021	.00013
486.0	168.807	36.847	1.1031	.00011
494.0	177.635	39.482	1.1039	.00009
502.0	186.469	42.125	1.1046	.00008
510.0	195.308	44.775	1.1051	.00006
518.0	204.151	47.432	1.1056	.00005
526.0	212.997	50.095	1.1060	.00004
534.0	221.847	52.763	1.1063	.00003
542.0	230.698	55.437	1.1065	.00002
550.0	239.551	58.114	1.1067	.00002
558.0	248.404	60.796	1.1068	.00001
566.0	257.259	63.481	1.1068	.00000
574.0	266.113	66.170	1.1068	-.00001
582.0	274.967	68.861	1.1067	-.00001
590.0	283.820	71.555	1.1066	-.00002
598.0	292.673	74.252	1.1064	-.00002



Table 26. Continued.

THE ISOCHORE AT 7.00 MOL/L				
T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
366.0	39.634	3.392	1.3563	.01280
374.0	50.702	6.978	1.4003	.00299
382.0	61.984	10.428	1.4187	.00181
390.0	73.385	13.869	1.4310	.00132
398.0	84.872	17.313	1.4404	.00104
406.0	96.426	20.765	1.4479	.00085
414.0	108.035	24.225	1.4541	.00072
422.0	119.689	27.692	1.4594	.00061
430.0	131.383	31.165	1.4639	.00053
438.0	143.111	34.645	1.4679	.00046
446.0	154.868	38.130	1.4713	.00040
454.0	166.650	41.619	1.4743	.00035
462.0	178.455	45.112	1.4769	.00030
470.0	190.279	48.609	1.4792	.00027
478.0	202.121	52.108	1.4812	.00023
486.0	213.977	55.610	1.4829	.00020
494.0	225.847	59.114	1.4844	.00018
502.0	237.727	62.619	1.4857	.00015
510.0	249.618	66.125	1.4869	.00013
518.0	261.517	69.632	1.4878	.00011
526.0	273.422	73.140	1.4886	.00009
534.0	285.334	76.648	1.4893	.00008
542.0	297.251	80.155	1.4899	.00006
550.0	309.172	83.663	1.4903	.00005
558.0	321.096	87.169	1.4906	.00004
566.0	333.022	90.675	1.4909	.00002
574.0	344.949	94.181	1.4910	.00001
582.0	356.878	97.684	1.4911	.00000
590.0	368.806	101.187	1.4911	-.00001
598.0	380.734	104.688	1.4910	-.00001

Table 26. Continued.

THE ISOCHORE AT 8.00 MOL/L				
T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
366.0	49.009	17.715	1.9117	.00255
374.0	64.374	22.783	1.9284	.00173
382.0	79.852	27.766	1.9405	.00132
390.0	95.415	32.700	1.9499	.00106
398.0	111.046	37.598	1.9576	.00087
406.0	126.732	42.470	1.9639	.00073
414.0	142.466	47.319	1.9693	.00062
422.0	158.240	52.150	1.9739	.00053
430.0	174.047	56.964	1.9779	.00046
438.0	189.884	61.763	1.9813	.00039
446.0	205.746	66.549	1.9842	.00034
454.0	221.630	71.321	1.9867	.00029
462.0	237.532	76.082	1.9888	.00024
470.0	253.450	80.831	1.9906	.00021
478.0	269.381	85.570	1.9921	.00017
486.0	285.323	90.298	1.9934	.00014
494.0	301.274	95.016	1.9944	.00011
502.0	317.232	99.724	1.9952	.00009
510.0	333.197	104.423	1.9958	.00007
518.0	349.165	109.112	1.9963	.00005
526.0	365.137	113.793	1.9966	.00003
534.0	381.110	118.465	1.9967	.00001
542.0	397.084	123.128	1.9968	-.00001
550.0	413.058	127.782	1.9967	-.00002
558.0	429.031	132.428	1.9964	-.00003
566.0	445.001	137.066	1.9961	-.00005
574.0	460.968	141.696	1.9957	-.00006
582.0	476.932	146.318	1.9952	-.00007
590.0	492.892	150.932	1.9947	-.00008
598.0	508.847	155.538	1.9940	-.00009

Table 26. Continued.

THE ISOCHORE AT 9.00 MOL/L				
T,K	P, BAR	DP/DD	DP/DT	D2P/DT2
350.0	38.937	37.009	2.6405	.00138
358.0	60.101	43.993	2.6498	.00100
366.0	81.329	50.865	2.6568	.00077
374.0	102.606	57.655	2.6623	.00061
382.0	123.922	64.380	2.6666	.00048
390.0	145.269	71.051	2.6701	.00039
398.0	166.642	77.675	2.6729	.00031
406.0	188.034	84.257	2.6751	.00024
414.0	209.442	90.802	2.6768	.00019
422.0	230.862	97.311	2.6781	.00014
430.0	252.290	103.790	2.6790	.00009
438.0	273.725	110.238	2.6796	.00006
446.0	295.163	116.659	2.6799	.00002
454.0	316.603	123.053	2.6800	-.00001
462.0	338.042	129.422	2.6798	-.00004
470.0	359.479	135.768	2.6794	-.00006
478.0	380.912	142.091	2.6788	-.00008
486.0	402.340	148.393	2.6781	-.00010
494.0	423.761	154.673	2.6771	-.00012
502.0	445.174	160.933	2.6761	-.00014
510.0	466.578	167.174	2.6749	-.00016
518.0	487.972	173.396	2.6736	-.00017
526.0	509.355	179.600	2.6722	-.00018
534.0	530.727	185.786	2.6707	-.00019
542.0	552.086	191.955	2.6691	-.00021
550.0	573.432	198.107	2.6674	-.00022
558.0	594.764	204.243	2.6657	-.00022
566.0	616.082	210.362	2.6638	-.00023
574.0	637.385	216.466	2.6619	-.00024
582.0	658.673	222.555	2.6600	-.00025
590.0	679.945	228.628	2.6580	-.00025

Table 26. Continued.

## THE ISOCHORE AT 10.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D <sup>2</sup> P/DT <sup>2</sup>
330.0	29.621	72.974	3.6370	-.00013
334.0	44.168	77.521	3.6365	-.00014
338.0	58.713	82.047	3.6359	-.00016
342.0	73.255	86.553	3.6352	-.00017
346.0	87.795	91.042	3.6345	-.00019
350.0	102.331	95.513	3.6337	-.00020
354.0	116.864	99.969	3.6329	-.00022
358.0	131.394	104.409	3.6320	-.00023
362.0	145.921	108.834	3.6311	-.00024
366.0	160.443	113.246	3.6301	-.00026
370.0	174.961	117.644	3.6290	-.00027
374.0	189.475	122.029	3.6279	-.00028
378.0	203.984	126.402	3.6267	-.00030
382.0	218.489	130.763	3.6255	-.00031
386.0	232.988	135.112	3.6243	-.00032
390.0	247.483	139.450	3.6230	-.00033
394.0	261.972	143.777	3.6217	-.00034
398.0	276.456	148.094	3.6203	-.00035
402.0	290.935	152.400	3.6189	-.00036
406.0	305.407	156.697	3.6174	-.00037
410.0	319.874	160.984	3.6159	-.00038
414.0	334.335	165.261	3.6144	-.00038
418.0	348.789	169.529	3.6129	-.00039
422.0	363.237	173.788	3.6113	-.00040
426.0	377.679	178.038	3.6097	-.00041
430.0	392.115	182.279	3.6080	-.00041
434.0	406.543	186.512	3.6063	-.00042
438.0	420.965	190.736	3.6047	-.00043
442.0	435.381	194.953	3.6029	-.00043
446.0	449.789	199.161	3.6012	-.00044
450.0	464.190	203.361	3.5994	-.00044
454.0	478.584	207.554	3.5976	-.00045
458.0	492.971	211.739	3.5958	-.00045
462.0	507.351	215.917	3.5940	-.00046
466.0	521.723	220.087	3.5921	-.00046
470.0	536.088	224.250	3.5903	-.00047
474.0	550.445	228.406	3.5884	-.00047
478.0	564.795	232.555	3.5865	-.00048
482.0	579.137	236.697	3.5846	-.00048
486.0	593.472	240.832	3.5827	-.00048
490.0	607.798	244.961	3.5807	-.00049
494.0	622.117	249.083	3.5788	-.00049
498.0	636.428	253.198	3.5768	-.00049
502.0	650.732	257.307	3.5748	-.00050
506.0	665.027	261.410	3.5728	-.00050
510.0	679.314	265.506	3.5708	-.00050
514.0	693.594	269.596	3.5688	-.00050

Table 26. Continued.

## THE ISOCHORE AT 11.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
306.0	27.429	132.742	4.9470	-.00122
310.0	47.208	138.590	4.9422	-.00118
314.0	66.967	144.430	4.9376	-.00114
318.0	86.709	150.260	4.9331	-.00111
322.0	106.433	156.080	4.9288	-.00108
326.0	126.139	161.890	4.9245	-.00106
330.0	145.828	167.690	4.9203	-.00104
334.0	165.501	173.480	4.9161	-.00103
338.0	185.158	179.260	4.9121	-.00101
342.0	204.798	185.029	4.9080	-.00100
346.0	224.422	190.788	4.9040	-.00100
350.0	244.030	196.537	4.9000	-.00099
354.0	263.622	202.276	4.8961	-.00098
358.0	283.199	208.005	4.8922	-.00098
362.0	302.760	213.723	4.8883	-.00097
366.0	322.305	219.432	4.8844	-.00097
370.0	341.835	225.131	4.8805	-.00097
374.0	361.349	230.820	4.8767	-.00096
378.0	380.848	236.499	4.8728	-.00096
382.0	400.332	242.169	4.8690	-.00096
386.0	419.800	247.830	4.8652	-.00096
390.0	439.253	253.481	4.8613	-.00096
394.0	458.691	259.122	4.8575	-.00095
398.0	478.113	264.754	4.8537	-.00095
402.0	497.521	270.378	4.8499	-.00095
406.0	516.913	275.992	4.8461	-.00095
410.0	536.289	281.597	4.8423	-.00095
414.0	555.651	287.193	4.8385	-.00095
418.0	574.997	292.780	4.8347	-.00095
422.0	594.329	298.359	4.8309	-.00095
426.0	613.645	303.929	4.8271	-.00095
430.0	632.946	309.490	4.8234	-.00095
434.0	652.232	315.043	4.8196	-.00094
438.0	671.502	320.587	4.8158	-.00094
442.0	690.758	326.123	4.8120	-.00094



Table 26. Continued.

## THE ISOCHORE AT 12.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
274.0	14.240	217.100	6.6864	-.00190
276.0	27.609	221.001	6.6826	-.00187
278.0	40.971	224.902	6.6789	-.00185
280.0	54.325	228.802	6.6752	-.00183
282.0	67.672	232.701	6.6716	-.00181
284.0	81.011	236.600	6.6680	-.00179
286.0	94.343	240.498	6.6644	-.00178
288.0	107.669	244.395	6.6609	-.00176
290.0	120.987	248.291	6.6573	-.00175
292.0	134.298	252.185	6.6539	-.00173
294.0	147.602	256.079	6.6504	-.00172
296.0	160.900	259.971	6.6470	-.00171
298.0	174.190	263.861	6.6436	-.00170
300.0	187.474	267.750	6.6402	-.00169
302.0	200.751	271.637	6.6368	-.00168
304.0	214.021	275.522	6.6334	-.00168
306.0	227.285	279.406	6.6301	-.00167
308.0	240.541	283.288	6.6268	-.00166
310.0	253.792	287.168	6.6234	-.00165
312.0	267.035	291.046	6.6201	-.00165
314.0	280.272	294.922	6.6168	-.00164
316.0	293.503	298.796	6.6136	-.00164
318.0	306.727	302.668	6.6103	-.00163
320.0	319.944	306.538	6.6070	-.00163
322.0	333.155	310.406	6.6038	-.00162
324.0	346.359	314.271	6.6005	-.00162
326.0	359.557	318.135	6.5973	-.00162
328.0	372.748	321.996	6.5941	-.00161
330.0	385.933	325.855	6.5909	-.00161
332.0	399.112	329.712	6.5877	-.00160
334.0	412.284	333.566	6.5844	-.00160
336.0	425.449	337.418	6.5812	-.00160
338.0	438.609	341.268	6.5780	-.00160
340.0	451.762	345.115	6.5749	-.00159
342.0	464.908	348.960	6.5717	-.00159
344.0	478.048	352.803	6.5685	-.00159
346.0	491.182	356.643	6.5653	-.00159
348.0	504.310	360.481	6.5622	-.00158
350.0	517.431	364.317	6.5590	-.00158
352.0	530.546	368.150	6.5558	-.00158
354.0	543.654	371.980	6.5527	-.00158
356.0	556.756	375.808	6.5495	-.00157
358.0	569.852	379.634	6.5464	-.00157
360.0	582.942	383.457	6.5432	-.00157
362.0	596.025	387.278	6.5401	-.00157
364.0	609.102	391.096	6.5370	-.00157
366.0	622.173	394.912	6.5338	-.00156
368.0	635.238	398.725	6.5307	-.00156
370.0	648.296	402.536	6.5276	-.00156
372.0	661.348	406.344	6.5245	-.00156
374.0	674.394	410.150	6.5213	-.00156
376.0	687.433	413.953	6.5182	-.00156

Table 26. Continued.

THE ISOCHORE AT 13.00 MOL/L				
T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
238.0	6.792	339.378	9.0779	-.00215
240.0	24.943	344.886	9.0736	-.00215
242.0	43.086	350.394	9.0693	-.00216
244.0	61.221	355.901	9.0650	-.00216
246.0	79.346	361.407	9.0607	-.00216
248.0	97.463	366.912	9.0564	-.00216
250.0	115.572	372.415	9.0520	-.00217
252.0	133.672	377.917	9.0477	-.00217
254.0	151.763	383.417	9.0434	-.00218
256.0	169.845	388.916	9.0390	-.00218
258.0	187.919	394.412	9.0346	-.00219
260.0	205.983	399.907	9.0302	-.00219
262.0	224.039	405.399	9.0258	-.00220
264.0	242.087	410.889	9.0214	-.00220
266.0	260.125	416.376	9.0170	-.00221
268.0	278.155	421.861	9.0126	-.00221
270.0	296.176	427.344	9.0082	-.00222
272.0	314.188	432.823	9.0037	-.00223
274.0	332.191	438.300	8.9993	-.00223
276.0	350.185	443.774	8.9948	-.00224
278.0	368.170	449.245	8.9903	-.00224
280.0	386.146	454.713	8.9858	-.00225
282.0	404.113	460.179	8.9813	-.00225
284.0	422.071	465.640	8.9768	-.00226
286.0	440.021	471.099	8.9723	-.00226
288.0	457.961	476.555	8.9678	-.00227
290.0	475.892	482.007	8.9633	-.00227
292.0	493.814	487.456	8.9587	-.00228
294.0	511.727	492.902	8.9542	-.00228
296.0	529.630	498.344	8.9496	-.00228
298.0	547.525	503.782	8.9450	-.00229
300.0	565.410	509.218	8.9404	-.00229
302.0	583.287	514.649	8.9359	-.00230
304.0	601.154	520.077	8.9313	-.00230
306.0	619.012	525.502	8.9267	-.00230
308.0	636.860	530.923	8.9220	-.00231
310.0	654.700	536.340	8.9174	-.00231
312.0	672.530	541.753	8.9128	-.00231
314.0	690.351	547.163	8.9082	-.00232

Table 26. Continued.

THE ISOCHORE AT 14.00 MOL/L				
T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
200.0	23.481	519.563	12.5377	-.00215
202.0	48.552	527.809	12.5334	-.00221
204.0	73.615	536.051	12.5289	-.00228
206.0	98.668	544.286	12.5243	-.00234
208.0	123.712	552.515	12.5195	-.00241
210.0	148.746	560.738	12.5146	-.00246
212.0	173.770	568.955	12.5097	-.00252
214.0	198.784	577.166	12.5046	-.00258
216.0	223.788	585.370	12.4993	-.00263
218.0	248.782	593.567	12.4940	-.00268
220.0	273.764	601.757	12.4886	-.00273
222.0	298.736	609.940	12.4831	-.00278
224.0	323.697	618.116	12.4775	-.00283
226.0	348.646	626.285	12.4718	-.00287
228.0	373.584	634.447	12.4660	-.00291
230.0	398.510	642.602	12.4601	-.00296
232.0	423.424	650.749	12.4542	-.00299
234.0	448.327	658.888	12.4482	-.00303
236.0	473.217	667.020	12.4421	-.00307
238.0	498.095	675.144	12.4359	-.00310
240.0	522.960	683.260	12.4296	-.00314
242.0	547.813	691.369	12.4233	-.00317
244.0	572.654	699.470	12.4170	-.00320
246.0	597.481	707.563	12.4105	-.00323
248.0	622.296	715.648	12.4040	-.00326
250.0	647.097	723.725	12.3975	-.00329
252.0	671.886	731.794	12.3909	-.00331
254.0	696.661	739.856	12.3842	-.00334

Table 26. Continued.

THE ISOCHORE AT 15.00 MOL/L				
T,K	P,BAR	OP/00	OP/0T	O2P/0T2
157.0	14.870	770.630	17.8443	-.00194
158.0	32.714	777.183	17.8423	-.00207
159.0	50.555	783.730	17.8402	-.00219
160.0	68.394	790.273	17.8379	-.00231
161.0	86.231	796.809	17.8356	-.00243
162.0	104.065	803.341	17.8331	-.00255
163.0	121.897	809.867	17.8305	-.00266
164.0	139.726	816.387	17.8278	-.00277
165.0	157.552	822.902	17.8249	-.00287
166.0	175.376	829.412	17.8220	-.00298
167.0	193.196	835.916	17.8190	-.00308
168.0	211.014	842.414	17.8158	-.00318
169.0	228.828	848.908	17.8126	-.00328
170.0	246.639	855.395	17.8093	-.00337
171.0	264.446	861.877	17.8059	-.00346
172.0	282.251	868.354	17.8024	-.00355
173.0	300.051	874.825	17.7988	-.00364
174.0	317.848	881.291	17.7951	-.00373
175.0	335.641	887.751	17.7913	-.00381
176.0	353.431	894.206	17.7875	-.00389
177.0	371.216	900.655	17.7835	-.00397
178.0	388.998	907.099	17.7795	-.00405
179.0	406.775	913.537	17.7754	-.00412
180.0	424.548	919.970	17.7713	-.00420
181.0	442.318	926.398	17.7670	-.00427
182.0	460.083	932.819	17.7627	-.00434
183.0	477.843	939.236	17.7584	-.00441
184.0	495.599	945.647	17.7539	-.00447
185.0	513.351	952.052	17.7494	-.00454
186.0	531.098	958.452	17.7448	-.00460
187.0	548.841	964.847	17.7402	-.00467
188.0	566.578	971.236	17.7355	-.00473
189.0	584.312	977.619	17.7308	-.00478
190.0	602.040	983.998	17.7259	-.00484
191.0	619.763	990.370	17.7211	-.00490
192.0	637.482	996.738	17.7161	-.00495
193.0	655.196	1003.100	17.7112	-.00501
194.0	672.904	1009.456	17.7061	-.00506
195.0	690.608	1015.807	17.7010	-.00511

Table 26. Continued.

## THE ISOCHORE AT 16.00 MOL/L

T,K	P,BAR	DP/DO	DP/DT	D2P/DT2
113.0	6.718	1167.797	26.5782	-.00169
114.0	33.295	1179.147	26.5763	-.00213
115.0	59.870	1190.478	26.5739	-.00255
116.0	86.443	1201.790	26.5712	-.00296
117.0	113.012	1213.082	26.5680	-.00336
118.0	139.579	1224.356	26.5645	-.00374
119.0	166.141	1235.610	26.5605	-.00411
120.0	192.700	1246.845	26.5562	-.00447
121.0	219.254	1258.061	26.5516	-.00481
122.0	245.803	1269.258	26.5466	-.00515
123.0	272.347	1280.437	26.5413	-.00547
124.0	298.885	1291.597	26.5357	-.00578
125.0	325.418	1302.739	26.5297	-.00608
126.0	351.945	1313.863	26.5235	-.00637
127.0	378.465	1324.968	26.5170	-.00665
128.0	404.978	1336.055	26.5102	-.00692
129.0	431.485	1347.123	26.5032	-.00718
130.0	457.985	1358.174	26.4959	-.00744
131.0	484.477	1369.207	26.4883	-.00768
132.0	510.961	1380.223	26.4805	-.00792
133.0	537.438	1391.220	26.4725	-.00815
134.0	563.906	1402.201	26.4642	-.00837
135.0	590.366	1413.163	26.4557	-.00858
136.0	616.818	1424.108	26.4471	-.00879
137.0	643.260	1435.036	26.4382	-.00898
138.0	669.694	1445.947	26.4291	-.00918
139.0	696.118	1456.841	26.4198	-.00936

## THE ISOCHORE AT 16.62 MOL/L

T,K	P,BAR	DP/DO	DP/DT	D2P/DT2
86.0	18.724	1568.820	35.3280	-.00211
87.0	54.051	1586.139	35.3254	-.00316
88.0	89.374	1603.409	35.3217	-.00417
89.0	124.694	1620.632	35.3170	-.00513
90.0	160.008	1637.807	35.3114	-.00605
91.0	195.317	1654.936	35.3050	-.00692
92.0	230.618	1672.019	35.2976	-.00776
93.0	265.911	1689.056	35.2894	-.00856
94.0	301.197	1706.048	35.2805	-.00932
95.0	336.472	1722.995	35.2708	-.01005
96.0	371.738	1739.898	35.2604	-.01075
97.0	406.993	1756.756	35.2493	-.01142
98.0	442.236	1773.572	35.2376	-.01206
99.0	477.468	1790.345	35.2252	-.01267
100.0	512.687	1807.075	35.2123	-.01325
101.0	547.892	1823.763	35.1987	-.01381
102.0	583.084	1840.409	35.1847	-.01434
103.0	618.261	1857.013	35.1701	-.01485
104.0	653.424	1873.577	35.1550	-.01534
105.0	688.571	1890.100	35.1394	-.01580



TABLE 27. Calculated  $P(\rho)$  isotherms

The following pages give  $P(\rho)$  isotherms, as computed by the equation of state (6). The third column  $DP/DD$  is the isotherm slope  $(\partial P/\partial \rho)$  in units of the bar and mol/L. The last two columns give the isochore slopes and curvatures,  $DP/DT \equiv (\partial P/\partial T)$ ,  $D^2P/DT^2 \equiv (\partial^2 P/\partial T^2)$  in units of the bar and kelvins.

These tables show that  $\partial P/\partial \rho$  is non-negative, and that it increases monotonically with density to pressures about twice those used for adjusting the equation of state.

Table 27. Calculated  $P(\rho)$  isotherms.

THE ISOTHERM AT 90.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
16.55	49.191	1529.744	34.1370	-.002909
16.60	127.570	1606.099	34.9706	-.005126
16.65	209.871	1686.680	35.8310	-.007470
16.70	296.313	1771.810	36.7195	-.009947
16.75	387.132	1861.846	37.6374	-.012565
16.80	482.587	1957.190	38.5863	-.015332

THE ISOTHERM AT 95.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
16.45	66.121	1465.221	32.5406	-.003180
16.50	141.146	1536.356	33.3141	-.005070
16.55	219.821	1611.263	34.1117	-.007068
16.60	302.341	1690.215	34.9344	-.009177
16.65	388.916	1773.512	35.7834	-.011404
16.70	479.770	1861.486	36.6599	-.013754
16.75	575.146	1954.503	37.5651	-.016235
16.80	675.312	2052.976	38.5005	-.018852

THE ISOTHERM AT 100.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
16.30	12.966	1341.361	30.3547	-.001823
16.35	81.604	1404.648	31.0539	-.003357
16.40	153.484	1471.107	31.7739	-.004979
16.45	228.769	1540.952	32.5156	-.006691
16.50	307.639	1614.417	33.2799	-.008498
16.55	390.277	1691.756	34.0677	-.010404
16.60	476.884	1773.247	34.8802	-.012414
16.65	567.676	1859.200	35.7183	-.014533
16.70	662.884	1949.954	36.5833	-.016767

THE ISOTHERM AT 110.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
16.10	45.484	1238.049	27.7549	-.002380
16.15	108.772	1293.887	28.3664	-.003526
16.20	174.916	1352.336	28.9952	-.004737
16.25	244.052	1413.554	29.6418	-.006015
16.30	316.321	1477.715	30.3069	-.007362
16.35	391.875	1545.006	30.9914	-.008782
16.40	470.877	1615.631	31.6958	-.010277
16.45	553.495	1689.811	32.4211	-.011850
16.50	639.920	1767.796	33.1681	-.013507
16.55	730.344	1849.848	33.9377	-.015249

Table 27. Continued.

## THE ISOTHERM AT 120.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
15.85	17.094	1097.746	24.9376	-.001857
15.90	73.163	1145.339	25.4630	-.002680
15.95	131.663	1195.001	26.0024	-.003550
16.00	192.700	1246.845	26.5562	-.004469
16.05	256.386	1300.993	27.1251	-.005439
16.10	322.840	1357.578	27.7094	-.006461
16.15	392.186	1416.741	28.3099	-.007537
16.20	464.559	1478.636	28.9269	-.008670
16.25	540.098	1543.429	29.5612	-.009861
16.30	618.953	1611.301	30.2134	-.011113
16.35	701.283	1682.448	30.8841	-.012429

## THE ISOTHERM AT 140.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
15.40	22.555	909.995	20.7852	-.001945
15.45	68.975	947.075	21.1928	-.002406
15.50	117.287	985.602	21.6104	-.002895
15.55	167.561	1025.641	22.0384	-.003414
15.60	219.877	1067.265	22.4770	-.003962
15.65	274.316	1110.552	22.9266	-.004541
15.70	330.961	1155.583	23.3875	-.005152
15.75	389.904	1202.444	23.8600	-.005795
15.80	451.238	1251.230	24.3446	-.006473
15.85	515.061	1302.040	24.8414	-.007185
15.90	581.477	1354.980	25.3511	-.007933
15.95	650.596	1410.165	25.8739	-.008719
16.00	722.533	1467.718	26.4104	-.009543

## THE ISOTHERM AT 160.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
14.95	29.625	760.664	17.5147	-.002050
15.00	68.394	790.273	17.8379	-.002312
15.05	108.670	820.940	18.1687	-.002592
15.10	150.506	852.712	18.5072	-.002890
15.15	193.960	885.632	18.8536	-.003208
15.20	239.090	919.751	19.2081	-.003545
15.25	285.955	955.119	19.5709	-.003902
15.30	334.623	991.792	19.9424	-.004280
15.35	385.158	1029.827	20.3226	-.004678
15.40	437.629	1069.283	20.7118	-.005099
15.45	492.110	1110.227	21.1103	-.005541
15.50	548.678	1152.726	21.5184	-.006007
15.55	607.411	1196.853	21.9363	-.006496
15.60	668.392	1242.685	22.3643	-.007009
15.65	731.709	1290.304	22.8027	-.007548

Table 27. Continued.

## THE ISOTHERM AT 180.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
14.45	7.283	615.906	14.6331	-.002013
14.50	38.658	639.202	14.8880	-.002148
14.55	71.216	663.272	15.1486	-.002295
14.60	104.998	688.145	15.4149	-.002454
14.65	140.044	713.850	15.6872	-.002625
14.70	176.398	740.421	15.9655	-.002809
14.75	214.102	767.888	16.2500	-.003007
14.80	253.202	796.289	16.5409	-.003217
14.85	293.747	825.658	16.8383	-.003441
14.90	335.785	856.034	17.1424	-.003679
14.95	379.367	887.458	17.4533	-.003931
15.00	424.548	919.970	17.7713	-.004198
15.05	471.383	953.616	18.0964	-.004479
15.10	519.930	988.442	18.4289	-.004776
15.15	570.248	1024.498	18.7690	-.005089
15.20	622.401	1061.834	19.1168	-.005417
15.25	676.453	1100.505	19.4727	-.005762
15.30	732.475	1140.570	19.8367	-.006125

## THE ISOTHERM AT 200.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
14.00	23.481	519.563	12.5377	-.002145
14.05	49.938	538.797	12.7462	-.002216
14.10	77.371	558.633	12.9590	-.002295
14.15	105.811	579.092	13.1763	-.002383
14.20	135.291	600.196	13.3983	-.002480
14.25	165.842	621.967	13.6250	-.002585
14.30	197.499	644.430	13.8565	-.002699
14.35	230.297	667.608	14.0930	-.002822
14.40	264.272	691.528	14.3345	-.002955
14.45	299.463	716.216	14.5812	-.003097
14.50	335.907	741.701	14.8333	-.003248
14.55	373.646	768.011	15.0907	-.003409
14.60	412.722	795.177	15.3538	-.003581
14.65	453.179	823.231	15.6225	-.003762
14.70	495.061	852.206	15.8970	-.003954
14.75	538.415	882.137	16.1775	-.004157
14.80	583.291	913.062	16.4641	-.004371
14.85	629.739	945.017	16.7570	-.004597
14.90	677.811	978.044	17.0564	-.004834
14.95	727.562	1012.184	17.3623	-.005083

Table 27. Continued.

## THE ISOTHERM AT 220.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
13.50	19.712	423.236	10.6356	-.002172
13.55	41.261	438.818	10.8046	-.002201
13.60	63.601	454.860	10.9770	-.002236
13.65	86.755	471.380	11.1529	-.002277
13.70	110.748	488.392	11.3324	-.002324
13.75	135.603	505.912	11.5155	-.002377
13.80	161.348	523.958	11.7023	-.002435
13.85	188.008	542.547	11.8930	-.002500
13.90	215.612	561.697	12.0875	-.002571
13.95	244.187	581.427	12.2860	-.002649
14.00	273.764	601.757	12.4886	-.002733
14.05	304.373	622.707	12.6954	-.002823
14.10	336.046	644.299	12.9064	-.002920
14.15	368.814	666.553	13.1218	-.003025
14.20	402.712	689.494	13.3417	-.003136
14.25	437.775	713.145	13.5661	-.003254
14.30	474.039	737.531	13.7952	-.003380
14.35	511.541	762.677	14.0291	-.003513
14.40	550.320	788.611	14.2679	-.003654
14.45	590.416	815.361	14.5117	-.003803
14.50	631.870	842.955	14.7607	-.003961
14.55	674.726	871.425	15.0148	-.004126
14.60	719.028	900.803	15.2744	-.004300

## THE ISOTHERM AT 240.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.05	.965	18.692	.0043	-.000002
12.95	8.010	332.484	8.9372	-.002149
13.00	24.943	344.886	9.0736	-.002154
13.05	42.505	357.638	9.2126	-.002163
13.10	60.713	370.749	9.3543	-.002176
13.15	79.586	384.232	9.4986	-.002193
13.20	99.142	398.097	9.6456	-.002214
13.25	119.402	412.357	9.7955	-.002238
13.30	140.385	427.025	9.9483	-.002267
13.35	162.111	442.113	10.1040	-.002300
13.40	184.603	457.634	10.2627	-.002337
13.45	207.882	473.603	10.4246	-.002379
13.50	231.971	490.033	10.5895	-.002424
13.55	256.894	506.940	10.7577	-.002474
13.60	282.674	524.339	10.9292	-.002529
13.65	309.336	542.245	11.1041	-.002588
13.70	336.907	560.675	11.2825	-.002651
13.75	365.413	579.647	11.4643	-.002720
13.80	394.881	599.177	11.6498	-.002793
13.85	425.340	619.284	11.8390	-.002872
13.90	456.819	639.937	12.0320	-.002955
13.95	489.349	661.306	12.2288	-.003044
14.00	522.960	683.260	12.4296	-.003138
14.05	557.686	705.873	12.6345	-.003238
14.10	593.559	729.165	12.8435	-.003344
14.15	630.614	753.159	13.0567	-.003455
14.20	668.887	777.879	13.2743	-.003573
14.25	708.415	803.351	13.4963	-.003697
14.30	749.235	829.600	13.7229	-.003827



Table 27. Continued.

## THE ISOTHERM AT 260.00 DEG. K

MOL/L	P, BAR	DP/DO	DP/DT	D2P/DT2
.05	1.051	20.458	.0043	-.000001
.10	2.046	19.363	.0088	-.000005
.15	2.986	18.239	.0136	-.000015
12.40	10.046	260.716	7.5468	-.002047
12.45	23.330	270.680	7.6589	-.002046
12.50	37.118	280.912	7.7729	-.002047
12.55	51.425	291.421	7.8889	-.002050
12.60	66.265	302.214	8.0070	-.002056
12.65	81.652	313.302	8.1271	-.002064
12.70	97.600	324.691	8.2493	-.002075
12.75	114.126	336.392	8.3737	-.002088
12.80	131.245	348.414	8.5003	-.002104
12.85	148.973	360.766	8.6293	-.002122
12.90	167.327	373.459	8.7605	-.002143
12.95	186.325	386.502	8.8942	-.002167
13.00	205.983	399.907	9.0302	-.002193
13.05	226.322	413.684	9.1688	-.002222
13.10	247.358	427.845	9.3100	-.002253
13.15	269.113	442.402	9.4538	-.002288
13.20	291.605	457.367	9.6002	-.002325
13.25	314.856	472.752	9.7495	-.002366
13.30	338.887	488.570	9.9015	-.002410
13.35	363.721	504.836	10.0564	-.002457
13.40	389.379	521.562	10.2142	-.002507
13.45	415.885	538.763	10.3751	-.002561
13.50	443.263	556.455	10.5390	-.002618
13.55	471.539	574.651	10.7061	-.002679
13.60	500.737	593.369	10.8764	-.002743
13.65	530.885	612.625	11.0500	-.002812
13.70	562.009	632.436	11.2270	-.002884
13.75	594.138	652.819	11.4074	-.002961
13.80	627.301	673.793	11.5913	-.003042
13.85	661.527	695.377	11.7789	-.003127
13.90	696.849	717.591	11.9701	-.003217
13.95	733.297	740.455	12.1651	-.003311

Table 27. Continued.

THE ISOTHERM AT 280.00 DEG. K				
MOL/L	P, BAR	DP/DD	DP/DT	D2P/DT2
.05	1.136	22.206	.0043	-.000001
.10	2.221	21.208	.0087	-.000003
.15	3.256	20.194	.0134	-.000008
.20	4.240	19.170	.0183	-.000017
.25	5.173	18.141	.0235	-.000032
11.80	11.882	196.185	6.2970	-.001811
11.85	21.887	204.027	6.3894	-.001814
11.90	32.288	212.072	6.4832	-.001818
11.95	43.097	220.329	6.5785	-.001823
12.00	54.325	228.802	6.6752	-.001830
12.05	65.981	237.497	6.7735	-.001837
12.10	78.078	246.421	6.8733	-.001846
12.15	90.627	255.581	6.9747	-.001856
12.20	103.640	264.982	7.0778	-.001868
12.25	117.130	274.632	7.1825	-.001880
12.30	131.108	284.538	7.2890	-.001894
12.35	145.588	294.708	7.3973	-.001909
12.40	160.583	305.149	7.5073	-.001925
12.45	176.108	315.869	7.6192	-.001943
12.50	192.175	326.876	7.7330	-.001962
12.55	208.800	338.178	7.8487	-.001983
12.60	225.998	349.784	7.9665	-.002005
12.65	243.784	361.703	8.0862	-.002029
12.70	262.173	373.945	8.2081	-.002054
12.75	281.184	386.518	8.3321	-.002082
12.80	300.831	399.432	8.4582	-.002111
12.85	321.133	412.699	8.5866	-.002142
12.90	342.107	426.327	8.7174	-.002174
12.95	363.772	440.328	8.8504	-.002209
13.00	386.146	454.713	8.9858	-.002247
13.05	409.250	469.494	9.1237	-.002286
13.10	433.102	484.682	9.2642	-.002328
13.15	457.725	500.290	9.4071	-.002372
13.20	483.138	516.329	9.5528	-.002418
13.25	509.365	532.814	9.7011	-.002467
13.30	536.427	549.758	9.8521	-.002519
13.35	564.349	567.174	10.0060	-.002574
13.40	593.153	585.078	10.1628	-.002631
13.45	622.865	603.484	10.3225	-.002692
13.50	653.510	622.407	10.4852	-.002755
13.55	685.114	641.864	10.6510	-.002822
13.60	717.705	661.870	10.8199	-.002892

Table 27. Continued.

## THE ISOTHERM AT 300.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.10	2.395	23.021	.0087	-.000002
.20	4.604	21.160	.0180	-.000011
.30	6.627	19.303	.0283	-.000030
.40	8.465	17.468	.0394	-.000064
11.10	10.680	135.257	5.1031	-.001357
11.20	24.796	147.152	5.2555	-.001394
11.30	40.131	159.671	5.4119	-.001431
11.40	56.752	172.846	5.5727	-.001467
11.50	74.724	186.711	5.7379	-.001503
11.60	94.118	201.302	5.9079	-.001539
11.70	115.010	216.658	6.0829	-.001576
11.80	137.477	232.822	6.2631	-.001614
11.90	161.602	249.836	6.4487	-.001652
12.00	187.474	267.750	6.6402	-.001692
12.10	215.184	286.612	6.8376	-.001735
12.20	244.830	306.478	7.0414	-.001779
12.30	276.515	327.405	7.2519	-.001827
12.40	310.348	349.452	7.4693	-.001878
12.50	346.445	372.686	7.6941	-.001934
12.60	384.927	397.174	7.9265	-.001993
12.70	425.924	422.992	8.1670	-.002059
12.80	469.572	450.215	8.4158	-.002130
12.90	516.017	478.928	8.6735	-.002207
13.00	565.410	509.218	8.9404	-.002292
13.10	617.916	541.179	9.2170	-.002384
13.20	673.705	574.911	9.5037	-.002485
13.30	732.960	610.522	9.8009	-.002595

## THE ISOTHERM AT 320.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.10	2.567	24.814	.0086	-.000002
.20	4.963	23.095	.0179	-.000008
.30	7.187	21.393	.0278	-.000020
.40	9.243	19.727	.0384	-.000040
.50	11.134	18.097	.0498	-.000069
.60	12.863	16.500	.0620	-.000113
.70	14.434	14.930	.0751	-.000180
.80	15.850	13.376	.0892	-.000290
10.40	23.619	92.486	4.1199	-.000632
10.50	33.506	101.329	4.2471	-.000726
10.60	44.101	110.650	4.3773	-.000811
10.70	55.653	120.471	4.5106	-.000889
10.80	68.213	130.815	4.6472	-.000962
10.90	81.834	141.706	4.7873	-.001029
11.00	96.573	153.171	4.9309	-.001093
11.10	112.488	165.237	5.0783	-.001153
11.20	129.641	177.935	5.2297	-.001210
11.30	148.097	191.295	5.3852	-.001265
11.40	167.924	205.352	5.5450	-.001319
11.50	189.192	220.143	5.7094	-.001371
11.60	211.978	235.705	5.8784	-.001422
11.70	236.360	252.080	6.0525	-.001473
11.80	262.422	269.312	6.2318	-.001524
11.90	290.253	287.448	6.4166	-.001575
12.00	319.944	306.538	6.6070	-.001628
12.10	351.594	326.634	6.8035	-.001682
12.20	385.306	347.794	7.0063	-.001738
12.30	421.190	370.076	7.2157	-.001796
12.40	459.361	393.545	7.4320	-.001858
12.50	499.941	418.268	7.6555	-.001923
12.60	543.059	444.317	7.8867	-.001993
12.70	588.851	471.769	8.1257	-.002067
12.80	637.462	500.703	8.3731	-.002146
12.90	689.044	531.206	8.6291	-.002231
13.00	743.759	563.370	8.8943	-.002323

Table 27. Continued.

## THE ISOTHERM AT 340.00 DEG. K

MOL/L	P,BAR	DP/DO	DP/DT	D2P/DT2
.10	2.739	26.590	.0086	-.000001
.20	5.318	24.993	.0177	-.000006
.30	7.739	23.419	.0274	-.000015
.40	10.004	21.885	.0377	-.000029
.50	12.117	20.394	.0487	-.000047
.60	14.084	18.942	.0602	-.000072
.70	15.907	17.526	.0724	-.000105
.80	17.590	16.142	.0852	-.000147
.90	19.136	14.790	.0988	-.000201
1.00	20.549	13.467	.1130	-.000271
1.10	21.831	12.172	.1280	-.000367
1.20	22.984	10.905	.1439	-.000503
1.30	24.013	9.663	.1607	-.000711
9.40	27.376	46.571	3.0032	.000839
9.50	32.300	51.977	3.1029	.000608
9.60	37.782	57.716	3.2048	.000413
9.70	43.855	63.804	3.3089	.000243
9.80	50.555	70.254	3.4153	.000093
9.90	57.918	77.082	3.5242	-.000041
10.00	65.984	84.302	3.6356	-.000163
10.10	74.793	91.931	3.7495	-.000276
10.20	84.385	99.986	3.8662	-.000379
10.30	94.805	108.484	3.9857	-.000475
10.40	106.097	117.445	4.1081	-.000565
10.50	118.310	126.888	4.2335	-.000649
10.60	131.492	136.836	4.3621	-.000729
10.70	145.694	147.310	4.4938	-.000804
10.80	160.972	158.335	4.6290	-.000876
10.90	177.381	169.938	4.7677	-.000944
11.00	194.980	182.146	4.9100	-.001010
11.10	213.831	194.988	5.0562	-.001072
11.20	234.000	208.497	5.2064	-.001133
11.30	255.554	222.706	5.3607	-.001193
11.40	278.565	237.652	5.5194	-.001251
11.50	303.110	253.371	5.6826	-.001308
11.60	329.267	269.907	5.8506	-.001364
11.70	357.120	287.301	6.0236	-.001421
11.80	386.757	305.601	6.2018	-.001477
11.90	418.272	324.855	6.3855	-.001534
12.00	451.762	345.115	6.5749	-.001593
12.10	487.330	366.438	6.7702	-.001653
12.20	525.087	388.882	6.9718	-.001715
12.30	565.146	412.509	7.1800	-.001779
12.40	607.630	437.387	7.3950	-.001846
12.50	652.667	463.584	7.6171	-.001917
12.60	700.393	491.175	7.8468	-.001992

## THE ISOTHERM AT 360.00 DEG. K

MOL/L	P,BAR	DP/DO	DP/DT	O2P/DT2
.20	5.671	26.865	.0176	-.000005
.40	10.753	23.979	.0372	-.000022
.60	15.275	21.266	.0590	-.000053
.80	19.269	18.701	.0828	-.000100
1.00	22.764	16.266	.1088	-.000166
1.20	25.784	13.959	.1369	-.000257
1.40	28.357	11.790	.1670	-.000380
1.60	30.510	9.771	.1991	-.000550
1.80	32.276	7.916	.2333	-.000795
2.00	33.688	6.233	.2695	-.001179
2.20	34.780	4.719	.3082	-.001874
8.00	37.592	13.798	1.8925	.004130
8.20	40.799	18.395	2.0293	.002964
8.40	45.004	23.802	2.1730	.002221
8.60	50.379	30.104	2.3243	.001686
8.80	57.111	37.381	2.4838	.001270
9.00	65.402	45.720	2.6518	.000928
9.20	75.475	55.208	2.8286	.000637
9.40	87.569	65.939	3.0146	.000382
9.60	101.940	78.011	3.2102	.000155
9.80	113.870	91.533	3.4157	-.000050
10.00	138.658	106.623	3.6315	-.000237
10.20	161.632	123.415	3.8584	-.000408
10.40	188.147	142.055	4.0969	-.000565
10.60	218.589	162.713	4.3477	-.000711
10.80	253.379	185.578	4.6118	-.000847
11.00	292.981	210.865	4.8902	-.000975
11.20	337.903	238.821	5.1841	-.001097
11.40	388.706	269.722	5.4948	-.001215
11.60	446.009	303.884	5.8237	-.001332
11.80	510.500	341.663	6.1726	-.001449
12.00	582.942	383.457	6.5432	-.001570
12.20	664.181	429.719	6.9377	-.001698

## THE ISOTHERM AT 369.80 DEG. K

MOL/L	P,BAR	DP/DO	DP/DT	O2P/DT2
.40	11.117	24.987	.0370	-.000020
.80	20.076	19.909	.0819	-.000086
1.20	27.114	15.362	.1346	-.000209
1.60	32.438	11.355	.1945	-.000405
2.00	36.283	7.983	.2608	-.000702
2.40	38.916	5.295	.3322	-.001156
2.80	40.607	3.265	.4075	-.001882
3.20	41.605	1.818	.4853	-.003153
3.60	42.126	.862	.5642	-.005708
4.00	42.348	.306	.6427	-.012157
4.40	42.413	.058	.7188	-.037355
4.80	42.420	.001	.7873	-.451909
5.20	42.421	.006	.8379	.239433
5.60	42.439	.121	.9193	.039082
6.00	42.560	.561	1.0229	.016198
6.40	42.969	1.612	1.1489	.009040
6.80	43.979	3.634	1.2994	.005818
7.20	46.063	7.059	1.4768	.004035
7.60	49.879	12.379	1.6832	.002895
8.00	56.291	20.136	1.9205	.002078
8.40	66.390	30.913	2.1903	.001442
8.80	81.506	45.325	2.4943	.000916
9.20	103.223	64.036	2.8340	.000466
9.60	133.406	87.784	3.2113	.000074
10.00	174.235	117.424	3.6291	-.000270
10.40	228.269	154.001	4.0913	-.000572
10.80	298.535	198.829	4.6036	-.000841
11.20	388.655	253.592	5.1734	-.001086
11.60	503.018	320.449	5.8107	-.001320
12.00	646.990	402.155	6.5279	-.001562



Table 27. Continued.

## THE ISOTHERM AT 380.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.40	11.493	26.026	.0368	-.000018
.80	20.908	21.144	.0811	-.000075
1.20	28.477	16.783	.1327	-.000175
1.60	34.403	12.940	.1909	-.000321
2.00	38.910	9.704	.2547	-.000509
2.40	42.253	7.119	.3230	-.000729
2.80	44.688	5.153	.3942	-.000953
3.20	46.448	3.732	.4673	-.001131
3.60	47.735	2.771	.5412	-.001187
4.00	48.717	2.200	.6159	-.001056
4.40	49.539	1.960	.6923	-.000722
4.80	50.320	1.980	.7723	-.000232
5.20	51.143	2.157	.8584	.000350
5.60	52.076	2.565	.9533	.000964
6.00	53.256	3.436	1.0608	.001510
6.40	54.922	5.039	1.1856	.001880
6.80	57.429	7.708	1.3322	.002017
7.20	61.285	11.853	1.5044	.001940
7.60	67.171	17.948	1.7055	.001714
8.00	75.974	26.526	1.9378	.001401
8.40	88.799	38.160	2.2029	.001050
8.80	106.991	53.467	2.5024	.000690
9.20	132.152	73.117	2.8380	.000339
9.60	166.164	97.862	3.2117	.000006
10.00	211.237	128.584	3.6261	-.000301
10.40	269.970	166.362	4.0854	-.000582
10.80	345.447	212.557	4.5950	-.000838
11.20	441.367	268.905	5.1624	-.001078
11.60	562.219	337.629	5.7973	-.001311
12.00	713.494	421.552	6.5120	-.001553

## THE ISOTHERM AT 400.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.40	12.227	28.035	.0365	-.000014
.80	22.516	23.508	.0798	-.000059
1.20	31.098	19.479	.1296	-.000132
1.60	38.163	15.930	.1855	-.000228
2.00	43.916	12.936	.2465	-.000336
2.40	48.591	10.535	.3118	-.000441
2.80	52.421	8.702	.3804	-.000523
3.20	55.621	7.379	.4518	-.000562
3.60	58.384	6.509	.5257	-.000541
4.00	60.884	6.058	.6026	-.000455
4.40	63.283	6.003	.6834	-.000307
4.80	65.733	6.301	.7694	-.000108
5.20	68.358	6.864	.8624	.000124
5.60	71.274	7.802	.9648	.000374
6.00	74.685	9.384	1.0794	.000615
6.40	78.906	11.902	1.2096	.000817
6.80	84.376	15.688	1.3592	.000951
7.20	91.677	21.130	1.5318	.000999
7.60	101.560	28.674	1.7309	.000956
8.00	114.963	38.818	1.9593	.000833
8.40	133.035	52.117	2.2194	.000646
8.80	157.157	69.176	2.5132	.000417
9.20	188.967	90.674	2.8429	.000164
9.60	230.391	117.388	3.2107	-.000096
10.00	283.696	150.248	3.6196	-.000354
10.40	351.561	190.400	4.0736	-.000601
10.80	437.179	239.289	4.5782	-.000837
11.20	544.400	298.756	5.1410	-.001066
11.60	677.964	371.139	5.7713	-.001294

Table 27. Continued.

## THE ISOTHERM AT 420.00 DEG. K

MDL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.40	12.954	30.015	.0363	-.000012
.80	24.101	25.811	.0787	-.000048
1.20	33.666	22.089	.1273	-.000104
1.60	41.831	18.813	.1815	-.000175
2.00	48.786	16.054	.2407	-.000250
2.40	54.748	13.848	.3043	-.000318
2.80	59.936	12.181	.3717	-.000367
3.20	64.559	11.009	.4426	-.000385
3.60	68.805	10.298	.5169	-.000366
4.00	72.857	10.039	.5952	-.000307
4.40	76.897	10.233	.6783	-.000211
4.80	81.101	10.855	.7675	-.000085
5.20	85.627	11.832	.8642	.000063
5.60	90.633	13.305	.9705	.000222
6.00	96.377	15.571	1.0890	.000377
6.40	103.237	18.941	1.2225	.000511
6.80	111.722	23.756	1.3743	.000606
7.20	122.485	30.401	1.5479	.000649
7.60	136.343	39.304	1.7464	.000631
8.00	154.293	50.944	1.9729	.000552
8.40	177.534	65.856	2.2299	.000421
8.80	207.493	84.637	2.5198	.000247
9.20	245.850	107.969	2.8450	.000045
9.60	294.581	136.653	3.2080	-.000172
10.00	356.014	171.659	3.6121	-.000396
10.40	432.911	214.196	4.0614	-.000619
10.80	528.577	265.790	4.5615	-.000838
11.20	647.007	328.380	5.1197	-.001056

## THE ISOTHERM AT 450.00 DEG. K

MDL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.40	14.037	32.941	.0359	-.000009
.80	26.442	29.181	.0775	-.000036
1.20	37.442	25.885	.1246	-.000078
1.60	47.205	23.002	.1770	-.000127
2.00	55.908	20.596	.2344	-.000178
2.40	63.751	18.708	.2964	-.000222
2.80	70.943	17.334	.3626	-.000252
3.20	77.684	16.452	.4331	-.000262
3.60	84.169	16.053	.5079	-.000249
4.00	90.593	16.153	.5876	-.000212
4.40	97.162	16.782	.6730	-.000153
4.80	104.089	17.938	.7651	-.000074
5.20	111.574	19.567	.8654	.000017
5.60	119.830	21.850	.9754	.000116
6.00	129.186	25.119	1.0975	.000212
6.40	140.102	29.711	1.2342	.000295
6.80	153.179	35.986	1.3883	.000355
7.20	169.166	44.329	1.5629	.000381
7.60	188.973	55.158	1.7610	.000367
8.00	213.686	68.936	1.9855	.000311
8.40	244.584	86.180	2.2391	.000214
8.80	283.170	107.479	2.5245	.000082
9.20	331.199	133.521	2.8444	-.000077
9.60	390.730	165.140	3.2015	-.000255
10.00	464.190	203.361	3.5994	-.000445
10.40	554.470	249.481	4.0425	-.000640
10.80	665.044	305.137	4.5363	-.000839

Table 27. Continued.

THE ISOTHERM AT 500.00 DEG. K				
MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.40	15.824	37.727	.0355	-.000006
.80	30.276	34.629	.0760	-.000025
1.20	43.587	31.989	.1214	-.000052
1.60	55.919	29.739	.1719	-.000083
2.00	67.437	27.934	.2273	-.000115
2.40	78.332	26.625	.2875	-.000142
2.80	88.805	25.822	.3526	-.000161
3.20	99.058	25.527	.4226	-.000168
3.60	109.297	25.761	.4979	-.000162
4.00	119.744	26.574	.5790	-.000143
4.40	130.642	28.027	.6665	-.000112
4.80	142.255	30.149	.7615	-.000070
5.20	154.845	32.914	.8652	-.000021
5.60	168.704	36.559	.9788	.000031
6.00	184.260	41.463	1.1044	.000082
6.40	202.093	48.006	1.2441	.000124
6.80	222.935	56.574	1.4003	.000152
7.20	247.676	67.568	1.5757	.000159
7.60	277.369	81.408	1.7730	.000141
8.00	313.242	98.548	1.9950	.000096
8.40	356.714	119.494	2.2445	.000022
8.80	409.423	144.835	2.5243	-.000077
9.20	473.263	175.282	2.8372	-.000200
9.60	550.446	211.716	3.1864	-.000340
10.00	643.581	255.253	3.5758	-.000495

THE ISOTHERM AT 550.00 DEG. K				
MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.40	17.594	42.432	.0353	-.000005
.80	34.046	39.930	.0749	-.000018
1.20	49.600	37.903	.1192	-.000037
1.60	64.420	36.269	.1684	-.000059
2.00	78.674	35.081	.2225	-.000081
2.40	92.552	34.391	.2816	-.000100
2.80	106.257	34.223	.3459	-.000114
3.20	120.002	34.596	.4155	-.000121
3.60	134.011	35.550	.4910	-.000120
4.00	148.529	37.160	.5727	-.000110
4.40	163.838	39.512	.6615	-.000093
4.80	180.245	42.657	.7581	-.000069
5.20	198.067	46.593	.8636	-.000041
5.60	217.663	51.606	.9792	-.000012
6.00	239.551	58.114	1.1067	.000015
6.40	264.410	66.535	1.2479	.000037
6.80	293.089	77.284	1.4050	.000047
7.20	326.604	90.782	1.5805	.000044
7.60	366.139	107.462	1.7768	.000022
8.00	413.058	127.782	1.9967	-.000020
8.40	468.918	152.256	2.2428	-.000083
8.80	535.497	181.485	2.5180	-.000166
9.20	614.838	216.208	2.8253	-.000268
9.60	709.319	257.359	3.1681	-.000387

Table 27. Continued.

THE ISOTHERM AT 600.00 DEG. K				
MOL/L	P, BAR	DP/DD	DP/DT	D2P/DT2
.40	19.352	47.079	.0351	-.000004
.80	37.771	45.125	.0741	-.000013
1.20	55.519	43.683	.1176	-.000028
1.60	72.772	42.656	.1658	-.000044
2.00	89.706	42.093	.2190	-.000061
2.40	106.516	42.051	.2772	-.000076
2.80	123.419	42.558	.3409	-.000087
3.20	140.640	43.647	.4102	-.000093
3.60	158.422	45.375	.4857	-.000095
4.00	177.038	47.834	.5678	-.000090
4.40	196.801	51.130	.6571	-.000081
4.80	218.063	55.332	.7546	-.000068
5.20	241.187	60.459	.8612	-.000053
5.60	266.597	66.838	.9779	-.000037
6.00	294.886	74.926	1.1064	-.000023
6.40	326.826	85.172	1.2483	-.000014
6.80	363.371	98.023	1.4057	-.000013
7.20	405.650	113.921	1.5808	-.000024
7.60	454.974	133.318	1.7760	-.000048
8.00	512.834	156.688	1.9938	-.000088
8.40	580.924	184.557	2.2370	-.000145
8.80	661.163	217.549	2.5082	-.000218

Table 28. The Joule-Thomson inversion locus.

THE JOULE-THOMSON INVERSION LOCUS FOR PROPANE

T,K	P,BAR	MOL/L	T,K	P,BAR	MOL/L
300	14.8	11.13	560	456.7	8.17
310	48.3	11.01	570	464.0	8.08
320	79.9	10.89	580	471.0	7.99
330	109.5	10.76	590	477.6	7.90
340	137.2	10.64	600	483.9	7.81
350	163.3	10.52	610	489.9	7.72
360	187.7	10.40	620	495.6	7.64
370	210.5	10.27	630	500.9	7.55
380	231.8	10.15	640	506.0	7.47
390	251.8	10.03	650	510.7	7.38
400	270.5	9.91	660	515.1	7.30
410	287.9	9.79	670	519.2	7.22
420	304.3	9.67	680	523.0	7.14
430	319.6	9.55	690	526.4	7.06
440	334.0	9.43	700	529.5	6.98
450	347.6	9.32	710	532.3	6.90
460	360.3	9.20	720	534.7	6.82
470	372.3	9.09	730	536.7	6.74
480	383.7	8.98	740	538.5	6.66
490	394.5	8.87	750	539.8	6.58
500	404.7	8.77	760	540.8	6.50
510	414.5	8.66	770	541.4	6.42
520	423.7	8.56	780	541.6	6.34
530	432.6	8.46	790	541.4	6.26
540	441.0	8.36	800	540.8	6.18
550	449.0	8.27	810	539.8	6.09



TABLE 29. Thermophysical properties of the saturated liquid

This table was computed along paths described in section 3.0. Column headings have the following interpretations--

DPS/DT	$\equiv$	$dP_{\sigma}/dT$ , vapor pressure,
DDL/DT	$\equiv$	$d\rho_{\ell}/dT$ , saturated liquid,
DP/DT	$\equiv$	$(\partial P/\partial T)$ , single phase,
DP/DD	$\equiv$	$(\partial P/\partial \rho)$ , single phase,
Q,VAP	$\equiv$	$\Delta H_{\text{vap}}$ , heat of vaporization,
CV	$\equiv$	$C_v(\rho, T)$ ,
CS	$\equiv$	$C_{\sigma}(T)$ ,
CP	$\equiv$	$C_p(\rho, T)$ ,
W	$\equiv$	speed of sound

Table 29. Thermophysical properties of the saturated liquid.

PROPERTIES OF SATURATED LIQUID PROPANE

T	P	DEN	V, LIQ	V, GAS	DPS/DT	DDL/DT	DP/DT	DP/DD	Q, VAP
DEG K	BAR	MOL/L	L/MOL	L/MOL	BAR/K	MOL/L/K	BAR/K	BAR-L/MOL	J/MOL
85.470	.3000E-08	16.620	.06017	.2369E+10	.1127E-08	-.02265	35.329	.1560E+04	24919
90.000	.1512E-07	16.517	.06054	.4930E+09	.5126E-08	-.02268	33.606	.1482E+04	24694
95.000	.7536E-07	16.404	.06096	.1042E+09	.2294E-07	-.02270	31.848	.1403E+04	24458
100.000	.3199E-06	16.290	.06139	.2582E+08	.8786E-07	-.02273	30.221	.1329E+04	24231
105.000	.1182E-05	16.177	.06182	.7339E+07	.2942E-06	-.02276	28.713	.1261E+04	24011
110.000	.3873E-05	16.063	.06226	.2349E+07	.8768E-06	-.02280	27.309	.1198E+04	23798
115.000	.1142E-04	15.949	.06270	.8340E+06	.2361E-05	-.02283	26.000	.1139E+04	23590
120.000	.3071E-04	15.834	.06315	.3242E+06	.5812E-05	-.02287	24.776	.1083E+04	23385
125.000	.7606E-04	15.720	.06361	.1365E+06	.1322E-04	-.02292	23.629	.1031E+04	23184
130.000	.1752E-03	15.605	.06408	.6172E+05	.2805E-04	-.02296	22.552	.9820E+03	22985
135.000	.3780E-03	15.490	.06456	.2973E+05	.5588E-04	-.02302	21.539	.9357E+03	22787
140.000	.7697E-03	15.375	.06504	.1515E+05	.1053E-03	-.02308	20.585	.8920E+03	22591
145.000	.1487E-02	15.259	.06553	.8123E+04	.1886E-03	-.02315	19.684	.8505E+03	22395
150.000	.2741E-02	15.144	.06603	.4560E+04	.3230E-03	-.02322	18.833	.8111E+03	22200
155.000	.4840E-02	15.027	.06655	.2668E+04	.5309E-03	-.02330	18.028	.7736E+03	22005
160.000	.8220E-02	14.910	.06707	.1621E+04	.8408E-03	-.02339	17.264	.7380E+03	21809
165.000	.1347E-01	14.793	.06760	.1019E+04	.1287E-02	-.02349	16.540	.7040E+03	21614
170.000	.2139E-01	14.676	.06814	.6606E+03	.1912E-02	-.02361	15.852	.6714E+03	21418
175.000	.3297E-01	14.557	.06869	.4406E+03	.2760E-02	-.02373	15.197	.6403E+03	21221
180.000	.4945E-01	14.438	.06926	.3016E+03	.3886E-02	-.02386	14.574	.6105E+03	21023
185.000	.7238E-01	14.319	.06984	.2114E+03	.5343E-02	-.02401	13.979	.5819E+03	20823
190.000	.1035E+00	14.198	.07043	.1515E+03	.7193E-02	-.02418	13.412	.5544E+03	20622
195.000	.1451E+00	14.077	.07104	.1107E+03	.9494E-02	-.02436	12.870	.5280E+03	20420
200.000	.1993E+00	13.954	.07166	.8238E+02	.1231E-01	-.02455	12.352	.5025E+03	20215
205.000	.2691E+00	13.831	.07230	.6235E+02	.1570E-01	-.02477	11.855	.4780E+03	20007
210.000	.3574E+00	13.707	.07296	.4792E+02	.1973E-01	-.02500	11.379	.4543E+03	19796
215.000	.4675E+00	13.581	.07363	.3736E+02	.2444E-01	-.02526	10.922	.4314E+03	19582
220.000	.6031E+00	13.454	.07433	.2950E+02	.2990E-01	-.02554	10.483	.4093E+03	19364
225.000	.7679E+00	13.326	.07504	.2358E+02	.3616E-01	-.02584	10.061	.3879E+03	19141
231.071	.1013E+01	13.168	.07594	.1823E+02	.4489E-01	-.02625	9.569	.3629E+03	18864
235.000	.1202E+01	13.064	.07655	.1555E+02	.5124E-01	-.02654	9.262	.3471E+03	18677
240.000	.1480E+01	12.930	.07734	.1281E+02	.6015E-01	-.02693	8.884	.3277E+03	18432
245.000	.1805E+01	12.795	.07816	.1064E+02	.7003E-01	-.02736	8.518	.3088E+03	18180
250.000	.2182E+01	12.657	.07901	.8909E+01	.8090E-01	-.02783	8.164	.2905E+03	17919
255.000	.2616E+01	12.516	.07990	.7511E+01	.9280E-01	-.02834	7.821	.2727E+03	17649
260.000	.3112E+01	12.373	.08082	.6373E+01	.1058E+00	-.02889	7.487	.2555E+03	17370
265.000	.3675E+01	12.227	.08179	.5440E+01	.1198E+00	-.02950	7.163	.2387E+03	17081
270.000	.4312E+01	12.078	.08280	.4668E+01	.1350E+00	-.03017	6.848	.2225E+03	16781
275.000	.5028E+01	11.925	.08386	.4025E+01	.1514E+00	-.03091	6.540	.2067E+03	16470
280.000	.5828E+01	11.769	.08497	.3486E+01	.1689E+00	-.03172	6.240	.1914E+03	16146
285.000	.6719E+01	11.608	.08615	.3031E+01	.1876E+00	-.03262	5.946	.1765E+03	15808
290.000	.7706E+01	11.442	.08739	.2645E+01	.2076E+00	-.03361	5.658	.1621E+03	15455
295.000	.8797E+01	11.272	.08872	.2315E+01	.2289E+00	-.03472	5.374	.1482E+03	15085
300.000	.9997E+01	11.095	.09013	.2032E+01	.2514E+00	-.03597	5.096	.1347E+03	14697
305.000	.1131E+02	10.912	.09165	.1788E+01	.2753E+00	-.03738	4.820	.1216E+03	14289
310.000	.1275E+02	10.721	.09328	.1576E+01	.3005E+00	-.03898	4.548	.1090E+03	13858
315.000	.1432E+02	10.521	.09504	.1391E+01	.3272E+00	-.04082	4.279	.9681E+02	13401
320.000	.1603E+02	10.312	.09697	.1229E+01	.3552E+00	-.04295	4.011	.8510E+02	12915
325.000	.1788E+02	10.091	.09910	.1087E+01	.3847E+00	-.04547	3.743	.7386E+02	12396
330.000	.1988E+02	9.857	.10145	.9611E+00	.4157E+00	-.04850	3.476	.6310E+02	11836
335.000	.2204E+02	9.605	.10411	.8487E+00	.4483E+00	-.05222	3.208	.5284E+02	11229
340.000	.2436E+02	9.333	.10715	.7479E+00	.4827E+00	-.05693	2.937	.4312E+02	10563
345.000	.2687E+02	9.033	.11070	.6565E+00	.5189E+00	-.06313	2.663	.3396E+02	9822
350.000	.2956E+02	8.697	.11498	.5726E+00	.5575E+00	-.07178	2.382	.2542E+02	8983
355.000	.3244E+02	8.308	.12036	.4942E+00	.5989E+00	-.08497	2.091	.1756E+02	8001
360.000	.3555E+02	7.831	.12769	.4185E+00	.6445E+00	-.10841	1.781	.1049E+02	6793
365.000	.3890E+02	7.171	.13945	.3402E+00	.6978E+00	-.15715	1.432	.4394E+01	5124
369.800	.4242E+02	4.960	.20161	.2016E+00	.8059E+00	0.00000	.806 0.		0

Table 29. Continued.

## PROPERTIES OF SATURATED LIQUID PROPANE

T	P	E	H	S	CV	CS	CP	M
DEG K	BAR	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
85.470	.3000E-08	5508.6	5508.6	82.628	59.28	84.04	84.04	2239
90.000	.1512E-07	5889.8	5889.8	86.973	59.13	84.27	84.27	2188
95.000	.7536E-07	6311.8	6311.8	91.536	59.01	84.53	84.53	2134
100.000	.3199E-06	6735.2	6735.2	95.878	58.92	84.80	84.80	2083
105.000	.1182E-05	7159.9	7159.9	100.022	58.86	85.08	85.08	2033
110.000	.3873E-05	7586.0	7586.0	103.986	58.83	85.37	85.37	1985
115.000	.1142E-04	8013.6	8013.6	107.787	58.83	85.67	85.67	1939
120.000	.3071E-04	8442.8	8442.8	111.440	58.86	85.99	85.99	1894
125.000	.7606E-04	8873.5	8873.5	114.956	58.92	86.31	86.31	1850
130.000	.1752E-03	9305.9	9305.9	118.348	59.01	86.66	86.66	1808
135.000	.3780E-03	9740.1	9740.1	121.625	59.12	87.02	87.02	1767
140.000	.7697E-03	10176.1	10176.1	124.796	59.26	87.39	87.39	1727
145.000	.1487E-02	10614.0	10614.1	127.869	59.42	87.79	87.79	1688
150.000	.2741E-02	11054.0	11054.0	130.852	59.60	88.21	88.21	1649
155.000	.4840E-02	11496.1	11496.2	133.752	59.81	88.64	88.64	1612
160.000	.8220E-02	11940.5	11940.5	136.573	60.04	89.10	89.11	1575
165.000	.1347E-01	12387.2	12387.3	139.322	60.29	89.59	89.59	1540
170.000	.2139E-01	12836.4	12836.6	142.004	60.56	90.10	90.10	1505
175.000	.3297E-01	13288.2	13288.5	144.623	60.86	90.64	90.64	1470
180.000	.4945E-01	13742.8	13743.2	147.185	61.17	91.20	91.21	1436
185.000	.7238E-01	14200.3	14200.8	149.691	61.51	91.80	91.81	1403
190.000	.1035E+00	14660.8	14661.6	152.148	61.86	92.43	92.44	1370
195.000	.1451E+00	15124.6	15125.6	154.557	62.24	93.09	93.11	1338
200.000	.1993E+00	15591.7	15593.2	156.922	62.63	93.78	93.81	1306
205.000	.2691E+00	16062.4	16064.4	159.247	63.05	94.51	94.56	1275
210.000	.3574E+00	16536.9	16539.5	161.533	63.48	95.28	95.34	1243
215.000	.4675E+00	17015.3	17018.7	163.785	63.94	95.10	96.17	1213
220.000	.6031E+00	17497.9	17502.3	166.004	64.41	95.95	97.04	1182
225.000	.7679E+00	17984.8	17990.5	168.192	64.90	97.85	97.97	1152
231.071	.1013E+01	18582.2	18589.9	170.813	65.53	99.00	99.16	1115
235.000	.1202E+01	18976.0	18985.2	172.508	65.95	99.79	99.98	1092
240.000	.1480E+01	19482.5	19494.0	174.648	66.50	100.84	101.07	1062
245.000	.1805E+01	19995.0	20009.1	176.769	67.07	101.94	102.23	1033
250.000	.2182E+01	20513.8	20531.0	178.872	67.65	103.11	103.46	1003
255.000	.2616E+01	21038.3	21059.2	180.957	68.26	104.33	104.77	974
260.000	.3112E+01	21569.3	21594.4	183.026	68.89	105.63	106.16	944
265.000	.3675E+01	22106.3	22136.4	185.079	69.53	107.00	107.63	915
270.000	.4312E+01	22650.0	22685.7	187.118	70.20	108.44	109.21	885
275.000	.5028E+01	23200.3	23242.4	189.144	70.88	109.97	110.90	856
280.000	.5828E+01	23757.6	23807.1	191.159	71.58	111.60	112.71	826
285.000	.6719E+01	24322.2	24380.1	193.164	72.30	113.32	114.66	796
290.000	.7706E+01	24894.5	24961.9	195.162	73.04	115.16	116.77	766
295.000	.8797E+01	25475.1	25553.1	197.154	73.80	117.13	119.06	736
300.000	.9997E+01	26064.5	26154.6	199.142	74.57	119.24	121.56	705
305.000	.1131E+02	26663.6	26767.3	201.131	75.37	121.52	124.32	674
310.000	.1275E+02	27273.3	27392.2	203.122	76.18	123.99	127.38	642
315.000	.1432E+02	27894.7	28030.8	205.121	77.01	126.70	130.82	610
320.000	.1603E+02	28529.2	28684.6	207.131	77.86	129.70	134.74	577
325.000	.1788E+02	29178.5	29355.7	209.157	78.73	133.06	139.28	544
330.000	.1988E+02	29845.0	30046.6	211.208	79.61	136.88	144.66	509
335.000	.2204E+02	30531.2	30760.6	213.290	80.52	141.34	151.23	474
340.000	.2436E+02	31241.1	31502.2	215.416	81.44	146.71	159.54	437
345.000	.2687E+02	31980.0	32277.4	217.602	82.38	153.45	170.65	399
350.000	.2956E+02	32756.2	33096.0	219.872	83.37	162.48	186.65	359
355.000	.3244E+02	33583.9	33974.4	222.270	84.47	175.84	212.52	316
360.000	.3555E+02	34494.8	34948.7	224.873	86.26	199.62	263.89	269
365.000	.3890E+02	35569.1	36111.6	227.957	89.42	259.35	420.78	216
369.800	.4242E+02	38102.3	38957.5	235.536	0.00	0.00	0.00	0

TABLE 30. Thermophysical properties along isobars\*

The following pages give physical and thermodynamic properties along selected isobars, as computed by methods of section 3 of the text.

The first line of each table refers to freezing liquid on the  $P(T)$  melting line.

Each table at  $P < P_c$  contains a blank line for the transition from saturated liquid to vapor, as seen by the abrupt decrease of density.

Table headings for partial derivatives have the following interpretations--

$$DP/DT \equiv \partial P/\partial T,$$

$$DP/DD \equiv \partial P/\partial \rho.$$

The specific heat interpretations are--

$$CV \equiv C_v(\rho, T),$$

$$CP \equiv C_p(\rho, T).$$

\* These tables are extrapolated beyond the range of some of the  $P$ - $\rho$ - $T$  data used for adjusting the equation of state. Small discontinuities may be detected at  $T = 405$  K along isobars at  $P > P_c = 42.4$  bar, due to change in the paths of computation, section 3 and figure 1.



Table 30. Thermophysical properties along isobars.

PROPANE ISOBAR AT P = .10000 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DO BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	M M/SEC
85.471	16.620	.06017	35.3297	1559.703	5508.6	5509.2	82.628	59.28	84.04	2239
90.000	16.517	.06054	33.6075	1482.096	5889.8	5890.4	86.972	59.13	84.27	2188
100.000	16.290	.06139	30.2223	1329.515	6735.1	6735.7	95.878	58.92	84.80	2083
110.000	16.063	.06226	27.3100	1198.040	7585.9	7586.5	103.985	58.83	85.37	1985
120.000	15.834	.06315	24.7767	1083.325	8442.6	8443.3	111.439	58.86	85.99	1894
130.000	15.605	.06408	22.5529	982.128	9305.8	9306.4	118.347	59.01	86.66	1808
140.000	15.375	.06504	20.5857	892.032	10176.0	10176.6	124.795	59.26	87.39	1727
150.000	15.144	.06603	18.8340	811.166	11053.9	11054.5	130.851	59.60	88.21	1649
160.000	14.911	.06707	17.2651	738.050	11940.3	11941.0	136.572	60.04	89.11	1576
170.000	14.676	.06814	15.8524	671.500	12836.3	12836.9	142.003	60.56	90.10	1505
180.000	14.438	.06926	14.5742	610.557	13742.7	13743.4	147.184	61.17	91.21	1436
189.501	14.210	.07037	13.4676	557.131	14614.7	14615.4	151.904	61.83	92.38	1373
189.501	.00639	156.445	.000535	15.518	33694.1	35258.5	260.826	46.14	54.69	204
190.000	.00637	156.866	.000533	15.561	33717.2	35285.9	260.970	46.21	54.77	204
200.000	.00605	165.293	.000506	16.414	34188.1	35841.0	263.816	47.74	56.25	209
210.000	.00576	173.703	.000481	17.263	34674.4	36411.5	266.598	49.33	57.82	214
220.000	.00549	182.101	.000458	18.110	35176.9	36997.9	269.325	50.99	59.45	218
230.000	.00525	190.488	.000438	18.956	35696.1	37601.0	272.005	52.71	61.15	223
240.000	.00503	198.867	.000419	19.799	36232.7	38221.3	274.645	54.47	62.90	227
250.000	.00483	207.239	.000402	20.641	36787.0	38859.4	277.249	56.29	64.70	231
260.000	.00464	215.606	.000387	21.482	37359.7	39515.8	279.822	58.14	66.55	236
270.000	.00446	223.967	.000372	22.322	37951.0	40190.7	282.369	60.03	68.43	240
280.000	.00430	232.324	.000359	23.162	38561.3	40884.5	284.892	61.95	70.33	244
290.000	.00415	240.677	.000346	24.000	39190.9	41597.6	287.394	63.89	72.27	248
300.000	.00402	249.027	.000334	24.838	39839.9	42330.2	289.877	65.85	74.22	251
310.000	.00389	257.374	.000323	25.675	40508.6	43082.3	292.342	67.82	76.19	255
320.000	.00376	265.719	.000313	26.512	41197.0	43854.2	294.793	69.81	78.17	259
330.000	.00365	274.061	.000304	27.349	41905.3	44646.0	297.229	71.80	80.16	263
340.000	.00354	282.401	.000295	28.185	42633.5	45457.6	299.651	73.79	82.15	266
350.000	.00344	290.740	.000286	29.021	43381.6	46289.0	302.061	75.78	84.14	270
360.000	.00334	299.077	.000278	29.856	44149.6	47140.4	304.459	77.77	86.12	273
370.000	.00325	307.413	.000271	30.691	44937.4	48011.5	306.846	79.75	88.10	277
380.000	.00317	315.747	.000264	31.526	45744.9	48902.4	309.221	81.72	90.07	280
390.000	.00309	324.080	.000257	32.361	46572.1	49812.9	311.586	83.68	92.02	284
400.000	.00301	332.412	.000250	33.196	47418.8	50742.9	313.940	85.63	93.97	287
410.000	.00293	340.743	.000244	34.030	48284.9	51692.3	316.284	87.56	95.90	290
420.000	.00286	349.073	.000238	34.864	49170.1	52660.9	318.618	89.47	97.81	293
430.000	.00280	357.402	.000233	35.698	50074.5	53648.5	320.942	91.37	99.71	297
440.000	.00273	365.731	.000227	36.532	50997.7	54655.0	323.256	93.25	101.58	300
450.000	.00267	374.058	.000222	37.366	51939.6	55680.2	325.559	95.11	103.44	303
460.000	.00262	382.385	.000218	38.200	52900.0	56723.8	327.853	96.95	105.28	306
470.000	.00256	390.712	.000213	39.033	53878.7	57785.8	330.137	98.77	107.10	309
480.000	.00251	399.038	.000208	39.867	54875.4	58865.8	332.410	100.56	108.89	312
490.000	.00245	407.363	.000204	40.700	55890.0	59963.6	334.674	102.34	110.67	315
500.000	.00241	415.688	.000200	41.534	56922.2	61079.1	336.927	104.09	112.42	318
520.000	.00231	432.336	.000192	43.200	59038.7	63362.1	341.404	107.53	115.85	324
540.000	.00223	448.983	.000185	44.866	61223.0	65712.8	345.839	110.87	119.20	330
560.000	.00215	465.629	.000179	46.532	63473.3	68129.6	350.233	114.13	122.45	336
580.000	.00207	482.273	.000172	48.198	65787.8	70610.5	354.586	117.30	125.62	342
600.000	.00200	498.916	.000167	49.863	68164.7	73153.8	358.897	120.37	128.69	347
620.000	.00194	515.558	.000161	51.528	70602.2	75757.7	363.165	123.36	131.64	351
640.000	.00188	532.199	.000156	53.193	73188.1	78488.1	367.410	126.36	134.64	355



85.475	16.620	.06017	35.3327	1560.037	5508.6	5511.6	82.628	59.28	84.04	2239
90.000	16.518	.06054	33.6118	1482.484	5889.5	5892.5	86.969	59.13	84.27	2188
100.000	16.291	.06138	30.2264	1329.883	6734.8	6737.8	95.874	58.92	84.80	2083
110.000	16.063	.06225	27.3139	1198.397	7585.5	7588.5	103.982	58.83	85.37	1985
120.000	15.835	.06315	24.7805	1083.659	8442.2	8445.4	111.435	58.86	85.98	1894
130.000	15.606	.06408	22.5566	982.457	9305.3	9308.5	118.343	59.01	86.65	1808
140.000	15.376	.06504	20.5893	892.352	10175.4	10178.7	124.791	59.26	87.39	1727
150.000	15.144	.06603	18.8375	811.479	11053.3	11056.6	130.847	59.60	88.20	1650
160.000	14.911	.06706	17.2685	738.357	11939.7	11943.0	136.568	60.04	89.10	1576
170.000	14.676	.06814	15.8558	671.802	12835.5	12838.9	141.999	60.56	90.10	1505
180.000	14.439	.06926	14.5775	610.855	13741.9	13745.4	147.179	61.17	91.21	1437
190.000	14.199	.07043	13.4154	554.727	14659.9	14663.5	152.143	61.86	92.44	1371
200.000	13.955	.07166	12.3540	502.764	15591.0	15594.6	156.918	62.63	93.81	1306
210.000	13.707	.07296	11.3802	454.424	16536.5	16540.1	161.531	63.48	95.34	1244
216.293	13.548	.07381	10.8071	425.650	17139.7	17143.4	164.362	64.06	96.39	1205
216.293	.02849	35.102	.002425	17.149	34915.0	36670.1	254.627	50.78	59.92	214
220.000	.02797	35.746	.002377	17.487	35105.9	36893.2	255.649	51.36	60.44	216
230.000	.02668	37.478	.002260	18.387	35631.4	37505.3	258.369	52.99	61.96	220
240.000	.02551	39.199	.002155	19.277	36173.1	38133.1	261.040	54.70	63.59	225
250.000	.02444	40.913	.002060	20.158	36731.9	38777.6	263.670	56.48	65.29	229
260.000	.02346	42.621	.001974	21.034	37308.4	39439.5	266.265	58.31	67.06	234
270.000	.02256	44.324	.001896	21.904	37903.1	40119.3	268.830	60.17	68.88	238
280.000	.02173	46.022	.001824	22.770	38516.3	40817.4	271.368	62.07	70.74	242
290.000	.02096	47.717	.001757	23.632	39148.5	41534.4	273.883	64.00	72.63	246
300.000	.02024	49.409	.001696	24.491	39799.9	42270.3	276.378	65.95	74.55	250
310.000	.01957	51.098	.001639	25.348	40470.7	43025.6	278.853	67.91	76.48	254
320.000	.01894	52.785	.001585	26.202	41161.1	43800.3	281.312	69.89	78.44	258
330.000	.01836	54.470	.001535	27.054	41871.1	44594.6	283.756	71.87	80.40	261
340.000	.01781	56.153	.001489	27.905	42600.9	45408.6	286.186	73.85	82.37	265
350.000	.01729	57.834	.001445	28.754	43350.5	46242.2	288.602	75.84	84.34	269
360.000	.01680	59.514	.001403	29.601	44119.8	47095.5	291.005	77.82	86.31	272
370.000	.01634	61.193	.001365	30.447	44908.9	47968.5	293.397	79.80	88.27	276
380.000	.01591	62.870	.001328	31.293	45717.6	48861.1	295.776	81.76	90.22	279
390.000	.01549	64.547	.001293	32.137	46545.8	49773.2	298.145	83.72	92.17	283
400.000	.01510	66.223	.001260	32.980	47393.5	50704.7	300.503	85.66	94.10	286
410.000	.01473	67.898	.001229	33.823	48260.5	51655.4	302.851	87.59	96.03	289
420.000	.01437	69.572	.001199	34.664	49146.7	52625.3	305.187	89.50	97.93	293
430.000	.01404	71.245	.001170	35.506	50051.9	53614.1	307.514	91.40	99.82	296
440.000	.01371	72.918	.001143	36.346	50975.9	54621.8	309.830	93.28	101.69	299
450.000	.01341	74.590	.001118	37.186	51918.5	55648.0	312.136	95.13	103.54	302
460.000	.01311	76.262	.001093	38.026	52879.6	56692.7	314.432	96.97	105.37	306
470.000	.01283	77.934	.001069	38.865	53858.9	57755.6	316.718	98.79	107.19	309
480.000	.01256	79.604	.001047	39.703	54856.3	58836.5	318.993	100.58	108.98	312
490.000	.01230	81.275	.001025	40.542	55871.5	59935.2	321.258	102.36	110.75	315
500.000	.01206	82.945	.001004	41.380	56904.8	61051.5	323.513	104.11	112.49	318
510.000	.01159	84.622	.000985	42.217	57921.8	62120.0	325.768	105.89	114.26	324
520.000	.01136	86.284	.000965	43.054	59021.8	63336.0	327.993	107.54	115.92	324
530.000	.01116	87.945	.000929	43.897	60120.0	64568.1	330.201	109.26	117.61	330
540.000	.01076	89.622	.000896	44.728	61207.0	65816.1	332.427	110.89	119.26	336
550.000	.01059	91.295	.000865	45.561	62294.0	67073.5	334.652	112.56	121.00	341
560.000	.01044	92.964	.000836	46.394	63381.1	68332.6	336.877	114.24	122.51	347
570.000	.01029	94.631	.000808	47.227	64470.0	69592.1	339.092	115.92	124.24	352
580.000	.01014	96.295	.000783	48.054	65561.1	70853.3	341.311	117.61	125.67	358
590.000	.00997	97.964	.000759	48.887	66644.4	72114.4	343.526	119.26	127.43	363
600.000	.00981	99.630	.000737	49.719	67721.1	73372.6	345.741	120.98	129.08	368
610.000	.00964	101.295	.000716	50.552	68792.2	74628.7	347.956	122.63	130.74	374
620.000	.00949	102.964	.000695	51.385	69857.3	75888.2	350.171	124.29	132.49	374
630.000	.00934	104.631	.000674	52.218	70922.4	77143.3	352.386	125.94	134.24	374
640.000	.00919	106.295	.000653	53.051	71987.5	78401.2	354.601	127.59	135.99	374
650.000	.00904	107.964	.000632	53.884	73052.6	79658.6	356.816	129.24	137.74	374
660.000	.00889	109.630	.000611	54.717	74117.7	80915.3	359.031	130.89	139.49	374
670.000	.00874	111.295	.000590	55.550	75182.8	82172.4	361.246	132.54	141.24	374
680.000	.00859	112.964	.000569	56.383	76247.9	83429.5	363.461	134.19	142.99	374
690.000	.00844	114.630	.000548	57.216	77313.0	84686.6	365.676	135.84	144.74	374
700.000	.00829	116.295	.000527	58.049	78378.1	85943.7	367.891	137.49	146.49	374

PROPANE ISOBAR AT P = 1.01325 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	M M/SEC
85.479	16.620	.06017	35.3365	1560.464	5508.7	5514.8	82.629	59.28	84.04	2239
90.000	16.518	.06054	33.6174	1482.981	5889.1	5895.2	86.965	59.13	84.27	2189
100.000	16.291	.06138	30.2317	1330.355	6734.3	6740.5	95.870	58.92	84.80	2083
110.000	16.063	.06225	27.3190	1198.850	7585.0	7591.3	103.977	58.83	85.37	1986
120.000	15.835	.06315	24.7853	1084.095	8441.7	8448.0	111.431	58.86	85.98	1894
130.000	15.606	.06408	22.5613	982.879	9304.7	9311.2	118.338	59.01	86.65	1809
140.000	15.376	.06504	20.5938	892.763	10174.7	10181.3	124.786	59.26	87.39	1727
150.000	15.145	.06603	18.8420	811.880	11052.5	11059.2	130.842	59.60	88.20	1650
160.000	14.912	.06706	17.2729	738.750	11938.8	11945.6	136.562	60.04	89.10	1576
170.000	14.677	.06813	15.8601	672.190	12834.6	12841.5	141.993	60.56	90.10	1505
180.000	14.440	.06925	14.5817	611.238	13740.8	13747.9	147.173	61.17	91.20	1437
190.000	14.200	.07042	13.4195	555.106	14658.8	14665.9	152.137	61.86	92.43	1371
200.000	13.956	.07165	12.3582	503.141	15589.7	15596.9	156.912	62.63	93.80	1307
210.000	13.708	.07295	11.3844	454.799	16535.1	16542.5	161.525	63.48	95.33	1244
220.000	13.455	.07432	10.4867	409.626	17496.6	17504.1	165.998	64.41	97.03	1182
230.000	13.196	.07578	9.6549	367.240	18476.1	18483.8	170.353	65.42	98.94	1122
231.071	13.168	.07594	9.5694	362.853	18582.2	18589.9	170.813	65.53	99.16	1115
231.071	.05486	18.227	.004749	17.771	35608.0	37454.8	252.454	53.66	63.41	218
240.000	.05259	19.015	.004525	18.630	36099.7	38026.4	254.880	55.08	64.62	222
250.000	.05028	19.889	.004305	19.572	36665.0	38680.3	257.549	56.78	66.14	227
260.000	.04818	20.756	.004109	20.498	37246.5	39349.6	260.174	58.55	67.78	231
270.000	.04626	21.617	.003934	21.411	37845.7	40036.0	262.764	60.38	69.50	236
280.000	.04450	22.473	.003774	22.315	38462.9	40740.0	265.323	62.25	71.27	240
290.000	.04287	23.325	.003629	23.211	39098.5	41462.0	267.856	64.15	73.10	244
300.000	.04137	24.175	.003495	24.099	39752.9	42202.4	270.366	66.08	74.97	248
310.000	.03997	25.021	.003372	24.982	40426.4	42961.6	272.855	68.03	76.86	252
320.000	.03866	25.865	.003257	25.859	41119.2	43739.9	275.325	69.99	78.78	256
330.000	.03744	26.706	.003151	26.733	41831.4	44537.4	277.779	71.96	80.71	260
340.000	.03630	27.546	.003052	27.602	42563.2	45354.3	280.217	73.94	82.65	264
350.000	.03523	28.384	.002959	28.469	43314.5	46190.6	282.641	75.92	84.59	268
360.000	.03422	29.221	.002872	29.332	44085.5	47046.3	285.051	77.89	86.54	271
370.000	.03327	30.057	.002791	30.193	44876.0	47921.5	287.448	79.86	88.48	275
380.000	.03237	30.891	.002714	31.051	45686.1	48816.2	289.834	81.82	90.42	278
390.000	.03152	31.725	.002641	31.908	46515.6	49730.1	292.207	83.77	92.35	282
400.000	.03072	32.557	.002572	32.763	47364.5	50663.3	294.570	85.71	94.27	285
410.000	.02995	33.389	.002507	33.616	48232.6	51615.7	296.921	87.64	96.18	289
420.000	.02922	34.220	.002445	34.467	49119.8	52587.1	299.262	89.55	98.07	292
430.000	.02853	35.050	.002386	35.318	50025.9	53577.3	301.591	91.44	99.95	295
440.000	.02787	35.880	.002330	36.167	50950.8	54586.3	303.911	93.31	101.82	299
450.000	.02724	36.709	.002277	37.014	51894.2	55613.7	306.219	95.17	103.66	302
460.000	.02664	37.538	.002226	37.861	52856.1	56659.6	308.518	97.00	105.48	305
470.000	.02606	38.366	.002177	38.707	53836.1	57723.5	310.806	98.82	107.29	308
480.000	.02551	39.193	.002131	39.552	54834.2	58805.4	313.083	100.61	109.07	311
490.000	.02499	40.021	.002086	40.397	55850.0	59905.1	315.350	102.38	110.84	314
500.000	.02448	40.848	.002044	41.241	56883.4	61022.3	317.607	104.13	112.58	317
520.000	.02353	42.501	.001963	42.926	59002.0	63308.4	322.090	107.57	116.00	324
540.000	.02265	44.153	.001889	44.609	61188.3	65662.0	326.530	110.91	119.33	329
560.000	.02183	45.804	.001821	46.290	63440.4	68081.4	330.929	114.16	122.57	335
580.000	.02107	47.454	.001757	47.970	65756.5	70564.7	335.286	117.32	125.73	341
600.000	.02037	49.103	.001698	49.648	68134.9	73110.2	339.600	120.40	128.79	347
620.000	.01970	50.752	.001642	51.324	70573.7	75716.1	343.872	123.38	131.77	352
640.000	.01908	52.400	.001590	53.000	73071.3	78380.7	348.101	126.28	134.66	358



85.484	16.621	•06017	35.3402	1560.868	5508.7	5517.7	82.629	59.28	84.04	2240
90.000	16.518	•06054	33.6227	1483.453	5888.7	5897.8	86.961	59.13	84.27	2189
100.000	16.291	•06138	30.2367	1330.803	6733.9	6743.1	95.866	58.92	84.80	2084
110.000	16.064	•06225	27.3238	1199.278	7584.6	7593.9	103.973	58.83	85.37	1986
120.000	15.836	•06315	24.7900	1084.508	8441.1	8450.6	111.426	58.86	85.98	1895
130.000	15.607	•06408	22.5657	983.279	9304.1	9313.7	118.334	59.01	86.65	1809
140.000	15.377	•06503	20.5982	893.152	10174.1	10183.8	124.781	59.26	87.39	1728
150.000	15.145	•06603	18.8462	812.261	11051.7	11061.7	130.837	59.60	88.20	1650
160.000	14.912	•06706	17.2770	739.123	11938.0	11948.0	136.557	60.04	89.10	1577
170.000	14.678	•06813	15.8641	672.557	12833.7	12843.9	141.988	60.56	90.09	1506
180.000	14.441	•06925	14.5857	611.600	13739.8	13750.2	147.168	61.17	91.20	1437
190.000	14.201	•07042	13.4235	555.465	14657.7	14668.2	152.131	61.86	92.43	1371
200.000	13.957	•07165	12.3621	503.497	15588.5	15599.2	156.906	62.63	93.80	1307
210.000	13.709	•07294	11.3883	455.154	16533.7	16544.6	161.518	63.48	95.32	1244
220.000	13.456	•07431	10.4906	409.981	17495.1	17506.2	165.991	64.41	97.03	1183
230.000	13.197	•07577	9.6588	367.596	18474.4	18485.8	170.345	65.42	98.93	1122
240.000	12.930	•07734	8.8841	327.685	19482.5	19494.1	174.648	66.50	101.07	1062
240.330	12.921	•07739	8.8594	326.405	19516.2	19527.8	174.789	66.53	101.15	1060
240.330	•07905	•006937	18.018	36046.5	37944.0	251.418	55.60	65.87	220	
250.000	•07552	•006572	18.994	36600.5	38586.8	254.039	57.11	67.08	224	
260.000	•07223	•006246	19.975	37188.3	39264.9	256.698	58.81	68.55	229	
270.000	•06925	•005959	20.935	37792.3	39958.4	259.315	60.59	70.14	234	
280.000	•06653	•005702	21.878	38413.6	40668.4	261.896	62.43	71.83	238	
290.000	•06403	•005469	22.808	39052.7	41395.5	264.447	64.31	73.59	243	
300.000	•06172	•005258	23.726	39710.2	42140.5	266.972	66.22	75.39	247	
310.000	•05959	•005064	24.636	40386.4	42903.7	269.474	68.15	77.24	251	
320.000	•05760	•004886	25.537	41081.6	43685.6	271.956	70.10	79.11	255	
330.000	•05576	•004721	26.432	41795.9	44486.3	274.419	72.06	81.01	259	
340.000	•05403	•004567	27.321	42529.6	45306.0	276.866	74.02	82.92	263	
350.000	•05241	•004425	28.205	43282.7	46144.8	279.297	75.99	84.84	267	
360.000	•05089	•004291	29.084	44055.2	47002.9	281.714	77.96	86.76	270	
370.000	•04945	•004166	29.959	44846.8	47879.9	284.117	79.92	88.69	274	
380.000	•04810	•004048	30.831	45658.2	48776.5	286.508	81.88	90.61	278	
390.000	•04683	•003938	31.700	46488.9	49692.2	288.886	83.82	92.52	281	
400.000	•04562	•003833	32.566	47338.9	50627.1	291.253	85.76	94.43	285	
410.000	•04447	•003734	33.429	48208.0	51581.0	293.608	87.68	96.33	288	
420.000	•04338	•003640	34.290	49096.1	52553.8	295.952	89.59	98.21	291	
430.000	•04235	•003552	35.150	50003.1	53545.4	298.284	91.47	100.08	295	
440.000	•04136	•003467	36.007	50928.8	54555.6	300.607	93.35	101.93	298	
450.000	•04042	•003387	36.863	51873.0	55584.2	302.918	95.20	103.77	301	
460.000	•03952	•003310	37.717	52835.6	56631.1	305.219	97.03	105.59	305	
470.000	•03866	•003237	38.569	53816.3	57696.0	307.509	98.84	107.39	308	
480.000	•03784	•003167	39.421	54815.0	58778.9	309.788	100.64	109.17	311	
490.000	•03706	•003100	40.271	55831.4	59879.4	312.057	102.41	110.92	314	
500.000	•03630	•003036	41.120	56865.3	60997.4	314.316	104.16	112.66	317	
510.000	•03488	•002916	42.816	58985.0	63285.1	318.801	107.59	116.07	323	
520.000	•03357	•002805	44.508	61172.1	65640.1	323.244	110.93	119.40	329	
530.000	•03236	•002703	46.198	63425.0	68060.7	327.645	114.18	122.63	335	
540.000	•03123	•002607	47.884	65741.9	70545.1	332.004	117.34	125.78	341	
550.000	•03018	•002519	49.569	68121.0	73091.6	336.320	120.41	128.84	346	
560.000	•02919	•002436	51.252	70560.4	75698.4	340.593	123.39	131.81	352	
570.000	•02827	•002359	52.933	73058.6	78363.8	344.824	126.29	134.70	357	
580.000	•02741	•002286	54.612	75613.8	81086.2	349.012	129.10	137.51	363	
590.000	•02660	•002218	56.291	78224.4	83863.9	353.158	131.83	140.23	368	
600.000	•02583	•002154	57.968	80888.7	86695.3	357.261	134.48	142.88	373	

Table 30. Continued.

PROPANE ISOBAR AT P = 2 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DI BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
85.489	16.621	.06017	35.3439	1561.284	5508.8	5520.8	82.630	59.28	84.04	2240
90.000	16.519	.06054	33.6281	1483.938	5888.3	5900.4	86.957	59.13	84.27	2189
100.000	16.292	.06138	30.2419	1331.264	6733.5	6745.8	95.861	58.92	84.80	2084
110.000	16.064	.06225	27.3287	1199.719	7584.1	7596.1	103.969	58.83	85.37	1986
120.000	15.836	.06315	24.7947	1084.933	8440.6	8453.2	111.422	58.86	85.98	1895
130.000	15.607	.06407	22.5703	983.690	9303.5	9316.3	118.329	59.01	86.65	1809
140.000	15.377	.06503	20.6026	893.552	10173.4	10186.4	124.777	59.26	87.38	1728
150.000	15.146	.06602	18.8505	812.652	11051.0	11064.2	130.832	59.60	88.19	1651
160.000	14.913	.06705	17.2813	739.507	11937.1	11950.6	136.552	60.04	89.09	1577
170.000	14.678	.06813	15.8683	672.934	12832.7	12846.4	141.982	60.56	90.09	1506
180.000	14.441	.06925	14.5898	611.973	13738.8	13752.7	147.162	61.17	91.19	1438
190.000	14.201	.07042	13.4275	555.834	14656.5	14670.6	152.125	61.86	92.42	1372
200.000	13.958	.07164	12.3661	503.864	15587.2	15601.5	156.899	62.63	93.79	1308
210.000	13.710	.07294	11.3923	455.519	16532.3	16546.9	161.511	63.48	95.31	1245
220.000	13.458	.07431	10.4946	410.347	17493.5	17508.4	165.984	64.41	97.02	1183
230.000	13.198	.07577	9.6629	367.963	18472.7	18487.9	170.338	65.42	98.92	1123
240.000	12.932	.07733	8.8882	328.054	19480.5	19496.0	174.640	66.50	101.06	1063
247.676	12.721	.07861	8.3271	298.929	20272.0	20287.8	177.897	67.38	102.88	1017
247.676	10.345	9.667	.009196	18.120	36395.9	38329.3	250.740	57.20	68.00	221
250.000	10.228	9.777	.009067	18.370	36532.3	38487.6	251.376	57.54	68.23	222
260.000	0.9762	10.244	.008569	19.416	37126.8	39175.6	254.075	59.13	69.45	227
270.000	0.9362	10.704	.008142	20.429	37736.5	39877.3	256.722	60.84	70.88	232
280.000	0.8962	11.158	.007767	21.416	38362.4	40594.0	259.328	62.63	72.45	237
290.000	0.8615	11.607	.007432	22.384	39005.4	41326.9	261.899	64.48	74.12	241
300.000	0.8297	12.053	.007129	23.336	39666.3	42076.8	264.441	66.36	75.86	245
310.000	0.8003	12.495	.006855	24.275	40345.4	42844.4	266.958	68.28	77.64	250
320.000	0.7731	12.935	.006603	25.202	41043.1	43630.1	269.451	70.21	79.47	254
330.000	0.7478	13.372	.006372	26.120	41759.8	44434.1	271.925	72.16	81.33	258
340.000	0.7243	13.807	.006158	27.029	42495.5	45256.9	274.381	74.11	83.21	262
350.000	0.7022	14.241	.005960	27.932	43250.4	46098.5	276.820	76.07	85.10	266
360.000	0.6815	14.673	.005775	28.828	44024.6	46959.1	279.244	78.03	87.00	269
370.000	0.6621	15.103	.005603	29.719	44818.0	47838.7	281.654	79.99	88.90	273
380.000	0.6438	15.533	.005441	30.605	45630.8	48737.3	284.050	81.94	90.81	277
390.000	0.6265	15.961	.005289	31.486	46462.7	49655.0	286.433	83.88	92.71	280
400.000	0.6102	16.389	.005146	32.364	47313.9	50591.6	288.804	85.81	94.60	284
410.000	0.5947	16.815	.005011	33.239	48184.0	51547.1	291.163	87.73	96.48	287
420.000	0.5800	17.241	.004883	34.110	49073.1	52521.3	293.511	89.63	98.35	291
430.000	0.5661	17.666	.004762	34.979	49981.0	53514.3	295.847	91.51	100.21	294
440.000	0.5528	18.091	.004647	35.845	50907.6	54525.7	298.172	93.38	102.06	298
450.000	0.5401	18.515	.004537	36.709	51852.6	55555.5	300.486	95.23	103.88	301
460.000	0.5280	18.938	.004434	37.571	52815.9	56603.5	302.789	97.06	105.69	304
470.000	0.5165	19.361	.004334	38.430	53797.3	57669.5	305.081	98.87	107.49	307
480.000	0.5055	19.784	.004240	39.289	54796.6	58753.3	307.363	100.66	109.26	310
490.000	0.4949	20.206	.004149	40.145	55813.3	59854.5	309.634	102.43	111.01	314
500.000	0.4848	20.628	.004063	41.000	56847.8	60973.3	311.894	104.18	112.74	317
520.000	0.4658	21.470	.003901	42.707	58968.5	63262.5	316.382	107.61	116.15	323
540.000	0.4482	22.312	.003751	44.409	61156.5	65618.9	320.828	110.95	119.46	329
560.000	0.4319	23.152	.003613	46.107	63410.3	68040.7	325.232	114.19	122.69	335
580.000	0.4168	23.992	.003485	47.801	65727.9	70526.3	329.592	117.35	125.83	340
600.000	0.4027	24.831	.003366	49.493	68107.6	73073.8	333.910	120.42	128.89	346
620.000	0.3896	25.669	.003255	51.182	70547.7	75681.5	338.185	123.40	131.86	352



85.498	16.621	.06016	35.3514	1562.115	5508.8	5526.9	82.631	59.28	84.04	2240
90.000	16.519	.06054	33.6389	1484.907	5587.6	5905.8	86.948	59.13	84.27	2190
100.000	16.293	.06138	30.2522	1332.184	6732.6	6751.0	95.853	58.92	84.80	2085
110.000	16.065	.06225	27.3386	1200.600	7583.1	7601.8	103.960	58.83	85.36	1987
120.000	15.837	.06314	24.8042	1085.782	8439.5	8458.4	111.413	58.86	85.98	1896
130.000	15.608	.06407	22.5795	984.513	9302.2	9321.5	118.320	59.01	86.64	1810
140.000	15.378	.06503	20.6115	894.353	10172.0	10191.5	124.767	59.26	87.38	1729
150.000	15.147	.06602	18.8592	813.434	11049.5	11069.3	130.822	59.60	88.19	1652
160.000	14.915	.06705	17.2898	740.274	11935.5	11955.6	136.542	60.04	89.09	1578
170.000	14.680	.06812	15.8766	673.689	12830.9	12851.3	141.971	60.56	90.08	1507
180.000	14.443	.06924	14.5980	612.718	13736.8	13757.5	147.151	61.17	91.18	1439
190.000	14.203	.07041	13.4356	556.571	14654.2	14675.4	152.113	61.86	92.41	1373
200.000	13.960	.07163	12.3741	504.596	15584.7	15606.2	156.887	62.63	93.78	1308
210.000	13.713	.07293	11.4003	456.249	16529.5	16551.4	161.498	63.48	95.30	1246
220.000	13.460	.07429	10.5026	411.077	17490.4	17512.7	165.970	64.41	97.00	1184
230.000	13.201	.07575	9.6709	368.695	18469.3	18492.0	170.323	65.42	98.90	1124
240.000	12.935	.07731	8.8964	328.792	19476.6	19499.8	174.624	66.50	101.03	1064
250.000	12.659	.07899	8.1707	291.099	20510.2	20533.9	178.858	67.66	103.43	1004
258.929	12.404	.08062	7.5580	259.123	21455.1	21479.2	182.584	68.75	105.85	951
258.929	.15156	6.598	.013787	18.096	36931.2	38910.6	249.905	59.77	71.62	221
260.000	.15075	6.634	.013689	18.221	36997.3	38987.4	250.201	59.92	71.68	222
270.000	.14368	6.960	.012875	19.361	37620.6	39708.5	252.922	61.42	72.62	227
280.000	.13739	7.278	.012190	20.451	38257.3	40440.8	255.585	63.09	73.87	233
290.000	.13172	7.592	.011597	21.504	38909.2	41186.7	258.202	64.86	75.31	237
300.000	.12657	7.900	.011074	22.528	39577.6	41947.7	260.781	66.68	76.88	242
310.000	.12187	8.206	.010607	23.530	40263.1	42724.8	263.329	68.55	78.53	247
320.000	.11754	8.508	.010185	24.513	40966.4	43518.7	265.849	70.45	80.25	251
330.000	.11354	8.807	.009801	25.480	41688.0	44330.1	268.346	72.37	82.02	255
340.000	.10984	9.105	.009450	26.433	42428.0	45159.4	270.821	74.30	83.82	260
350.000	.10638	9.400	.009127	27.375	43186.8	46006.8	273.277	76.24	85.65	264
360.000	.10316	9.694	.008829	28.307	43964.5	46872.6	275.716	78.18	87.50	268
370.000	.10014	9.986	.008551	29.231	44761.1	47756.9	278.138	80.12	89.35	271
380.000	.09730	10.277	.008293	30.146	45576.4	48659.6	280.546	82.06	91.22	275
390.000	.09463	10.567	.008051	31.055	46411.0	49581.2	282.939	83.99	93.08	279
400.000	.09211	10.856	.007825	31.958	47264.5	50521.4	285.319	85.91	94.94	283
410.000	.08973	11.145	.007612	32.855	48136.8	51480.2	287.687	87.82	96.80	286
420.000	.08747	11.432	.007411	33.748	49027.9	52457.5	290.041	89.71	98.65	290
430.000	.08533	11.719	.007221	34.636	49937.7	53453.2	292.384	91.59	100.48	293
440.000	.08330	12.005	.007042	35.520	50865.9	54467.3	294.715	93.46	102.31	296
450.000	.08137	12.290	.006872	36.401	51812.5	55499.5	297.035	95.30	104.12	300
460.000	.07952	12.575	.006711	37.279	52777.3	56549.8	299.343	97.13	105.91	303
470.000	.07777	12.859	.006557	38.153	53760.1	57617.9	301.640	98.93	107.69	306
480.000	.07608	13.143	.006411	39.025	54760.7	58703.7	303.925	100.72	109.45	310
490.000	.07448	13.427	.006271	39.895	55778.9	59807.0	306.200	102.48	111.19	313
500.000	.07294	13.710	.006138	40.762	56814.6	60927.6	308.464	104.23	112.91	316
520.000	.07005	14.275	.005888	42.491	58937.3	63219.9	312.959	107.65	116.30	322
540.000	.06739	14.840	.005659	44.212	61127.3	65579.1	317.410	110.98	119.60	328
560.000	.06492	15.403	.005447	45.928	63382.6	68003.5	321.818	114.23	122.81	334
580.000	.06264	15.965	.005252	47.638	65701.7	70491.3	326.182	117.38	125.94	340
600.000	.06051	16.527	.005070	49.344	68082.8	73040.8	330.503	120.45	128.99	346
620.000	.05852	17.088	.004901	51.046	70524.1	75650.4	334.781	123.43	131.95	351
640.000	.05666	17.648	.004743	52.745	73023.9	78318.4	339.016	126.32	134.82	357
660.000	.05492	18.208	.004595	54.440	75580.6	81043.1	343.208	129.13	137.62	362
680.000	.05328	18.768	.004456	56.133	78192.6	83822.9	347.357	131.86	140.34	368
700.000	.05174	19.327	.004326	57.824	80858.2	86656.2	351.453	134.51	142.97	373



## PROPANE ISOBAR AT P = 4 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DO BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
85.507	16.622	.06016	35.3589	1562.947	5508.9	5533.0	82.631	59.28	84.04	2241
90.000	16.520	.06053	33.6498	1485.877	5886.8	5911.1	86.940	59.13	84.26	2191
100.000	16.293	.06137	30.2625	1333.105	6731.8	6756.3	95.844	58.92	84.79	2085
110.000	16.066	.06224	27.3484	1201.482	7582.1	7607.0	103.951	58.83	85.36	1988
120.000	15.838	.06314	24.8137	1086.631	8438.4	8463.6	111.404	58.86	85.97	1897
130.000	15.609	.06406	22.5887	985.335	9301.0	9326.6	118.310	59.01	86.64	1811
140.000	15.379	.06502	20.6204	895.153	10170.6	10196.7	124.757	59.26	87.37	1730
150.000	15.148	.06601	18.8679	814.216	11048.0	11074.4	130.812	59.60	88.18	1652
160.000	14.916	.06704	17.2983	741.040	11933.8	11960.6	136.531	60.04	89.08	1579
170.000	14.681	.06811	15.8850	674.443	12829.0	12856.3	141.960	60.56	90.07	1508
180.000	14.445	.06923	14.6062	613.462	13734.7	13762.4	147.139	61.17	91.17	1439
190.000	14.205	.07040	13.4437	557.309	14652.0	14680.1	152.101	61.86	92.40	1373
200.000	13.962	.07162	12.3822	505.329	15582.2	15610.8	156.874	62.63	93.76	1309
210.000	13.715	.07291	11.4083	456.979	16526.7	16555.9	161.485	63.48	95.28	1247
220.000	13.462	.07428	10.5106	411.806	17487.3	17517.0	165.956	64.41	96.98	1185
230.000	13.204	.07574	9.6790	369.428	18465.8	18496.1	170.308	65.42	98.87	1125
240.000	12.938	.07729	8.9045	329.530	19472.8	19503.7	174.608	66.50	101.00	1065
250.000	12.663	.07897	8.1791	291.845	20505.8	20537.4	178.840	67.66	103.40	1005
260.000	12.377	.08080	7.4950	256.144	21564.9	21597.2	183.009	68.89	106.11	945
267.624	12.149	.08231	6.9969	230.137	22390.8	22423.7	186.151	69.88	108.45	899
267.624	.19933	5.017	.018515	17.911	37342.8	39349.6	249.396	61.87	74.76	221
270.000	.19691	5.078	.018206	18.212	37495.9	39527.3	250.057	62.17	74.84	222
280.000	.18754	5.332	.017072	19.426	38146.3	40279.1	252.791	63.64	75.59	228
290.000	.17925	5.579	.016130	20.578	38808.9	41040.4	255.452	65.29	76.70	234
300.000	.17181	5.820	.015320	21.685	39485.9	41814.1	258.084	67.04	78.04	239
310.000	.16508	6.058	.014610	22.757	40178.7	42601.9	260.667	68.85	79.52	244
320.000	.15894	6.292	.013979	23.801	40888.3	43405.0	263.216	70.71	81.11	248
330.000	.15330	6.523	.013412	24.821	41615.2	44224.4	265.737	72.59	82.77	253
340.000	.14811	6.752	.012899	25.822	42359.8	45060.5	268.234	74.50	84.48	257
350.000	.14330	6.979	.012431	26.806	43122.8	45914.2	270.708	76.41	86.24	261
360.000	.13882	7.204	.012002	27.775	43904.2	46785.6	273.162	78.34	88.03	266
370.000	.13464	7.427	.011606	28.733	44704.1	47674.9	275.599	80.26	89.83	270
380.000	.13073	7.649	.011238	29.679	45522.7	48582.4	278.018	82.19	91.65	273
390.000	.12706	7.870	.010897	30.616	46360.0	49508.1	280.423	84.11	93.48	277
400.000	.12361	8.090	.010578	31.545	47216.0	50452.1	282.812	86.02	95.30	281
410.000	.12035	8.309	.010280	32.466	48090.6	51414.3	285.188	87.92	97.13	285
420.000	.11727	8.527	.010000	33.380	48983.8	52394.8	287.550	89.80	98.95	288
430.000	.11435	8.745	.009736	34.289	49895.5	53393.4	289.900	91.68	100.77	292
440.000	.11159	8.962	.009487	35.192	50825.5	54410.2	292.237	93.53	102.57	295
450.000	.10896	9.178	.009252	36.090	51773.7	55444.9	294.562	95.37	104.36	299
460.000	.10646	9.394	.009029	36.984	52740.0	56497.5	296.876	97.19	106.14	302
470.000	.10407	9.609	.008817	37.874	53724.3	57567.8	299.177	98.99	107.90	305
480.000	.10180	9.824	.008616	38.760	54726.2	58655.6	301.467	100.78	109.65	309
490.000	.09962	10.038	.008424	39.643	55745.4	59760.5	303.746	102.54	111.38	312
500.000	.09754	10.252	.008242	40.523	56782.2	60882.9	306.013	104.28	113.09	315
520.000	.09365	10.679	.007900	42.274	58907.0	63107.5	310.514	107.69	116.45	321
540.000	.09006	11.104	.007588	44.016	61098.8	65540.5	314.971	111.02	119.73	328
560.000	.08674	11.529	.007300	45.750	63355.9	67967.4	319.383	114.26	122.93	334
580.000	.08366	11.953	.007035	47.476	65676.4	70457.5	323.752	117.41	126.05	339
600.000	.08080	12.376	.006789	49.197	68058.8	73009.1	328.076	120.48	129.08	345
620.000	.07814	12.798	.006560	50.912	70501.3	75620.6	332.357	123.45	132.04	351
640.000	.07564	13.220	.006346	52.623	73002.3	78290.2	336.595	126.35	134.94	356

85.516	16.622	.06016	35.3664	1563.779	5509.0	5539.1	82.632	59.28	84.03	2242
90.000	16.521	.06053	33.6606	1486.846	5886.1	5916.4	86.932	59.13	84.26	2191
100.000	16.294	.06137	30.2728	1334.026	6730.9	6761.6	95.836	58.92	84.79	2086
110.000	16.067	.06224	27.3583	1202.363	7581.2	7612.3	103.942	58.83	85.36	1988
120.000	15.839	.06314	24.8232	1087.480	8437.3	8468.9	111.394	58.86	85.97	1897
130.000	15.610	.06406	22.5978	986.157	9299.8	9331.8	118.301	59.01	86.64	1811
140.000	15.381	.06502	20.6294	895.953	10169.3	10201.8	124.747	59.26	87.37	1730
150.000	15.150	.06601	18.8766	814.997	11046.5	11079.5	130.802	59.60	88.18	1653
160.000	14.917	.06704	17.3067	741.807	11932.1	11965.6	136.521	60.04	89.07	1579
170.000	14.683	.06811	15.8933	675.197	12827.2	12861.2	141.950	60.56	90.06	1508
180.000	14.446	.06922	14.6144	614.207	13732.6	13767.3	147.128	61.17	91.16	1440
190.000	14.207	.07039	13.4518	558.046	14649.7	14684.9	152.089	61.86	92.39	1374
200.000	13.964	.07161	12.3902	506.061	15579.7	15615.5	156.862	62.63	93.75	1310
210.000	13.717	.07290	11.4163	457.709	16523.9	16560.4	161.472	63.49	95.27	1248
220.000	13.465	.07427	10.5186	412.536	17484.2	17521.4	165.942	64.41	96.96	1186
230.000	13.207	.07572	9.6870	370.160	18462.4	18500.2	170.292	65.42	98.85	1126
240.000	12.941	.07727	8.9127	330.267	19468.9	19507.5	174.592	66.50	100.97	1066
250.000	12.666	.07895	8.1874	292.590	20501.5	20540.9	178.823	67.66	103.36	1006
260.000	12.381	.08077	7.5036	256.902	21559.9	21600.3	182.990	68.89	106.07	947
270.000	12.081	.08277	6.8542	223.007	22646.1	22687.5	187.104	70.20	109.17	886
274.818	11.931	.08382	6.5516	207.265	23180.1	23222.0	189.071	70.85	110.84	857
274.818	.24712	4.047	.023401	17.642	37680.7	39704.0	249.045	63.67	77.64	220
280.000	.24050	4.158	.022522	18.337	38027.5	40106.5	250.496	64.31	77.70	224
290.000	.22902	4.366	.021096	19.607	38703.1	40886.3	253.232	65.79	78.34	230
300.000	.21888	4.569	.019911	20.808	39390.3	41674.7	255.904	67.44	79.37	235
310.000	.20980	4.766	.018895	21.958	40091.4	42474.6	258.527	69.18	80.63	240
320.000	.20161	4.960	.018009	23.067	40808.0	43288.0	261.109	70.96	82.05	245
330.000	.19415	5.151	.017223	24.145	41540.7	44116.0	263.657	72.83	83.59	250
340.000	.18731	5.339	.016518	25.195	42290.6	44960.0	266.176	74.70	85.20	255
350.000	.18101	5.525	.015882	26.224	43058.1	45820.3	268.670	76.60	86.87	259
360.000	.17518	5.708	.015303	27.233	43843.5	46697.7	271.141	78.50	88.59	263
370.000	.16976	5.891	.014772	28.226	44646.9	47592.3	273.592	80.41	90.34	268
380.000	.16470	6.072	.014283	29.205	45468.7	48504.6	276.024	82.32	92.10	272
390.000	.15996	6.251	.013830	30.171	46308.9	49434.6	278.440	84.23	93.89	276
400.000	.15552	6.430	.013410	31.126	47167.5	50382.5	280.840	86.12	95.68	280
410.000	.15134	6.608	.013018	32.072	48044.5	51348.3	283.224	88.01	97.47	283
420.000	.14739	6.785	.012651	33.009	48939.6	52331.9	285.595	89.89	99.27	287
430.000	.14367	6.961	.012307	33.938	49853.3	53333.6	287.951	91.76	101.06	291
440.000	.14014	7.136	.011983	34.860	50785.2	54353.1	290.295	93.61	102.84	294
450.000	.13679	7.311	.011678	35.776	51735.1	55390.4	292.626	95.44	104.61	298
460.000	.13360	7.485	.011389	36.687	52702.9	56445.4	294.944	97.26	106.37	301
470.000	.13057	7.659	.011116	37.592	53688.6	57517.9	297.251	99.05	108.12	305
480.000	.12769	7.832	.010856	38.493	54691.9	58607.7	299.545	100.83	109.85	308
490.000	.12493	8.005	.010610	39.389	55712.6	59714.9	301.828	102.59	111.56	311
500.000	.12230	8.177	.010375	40.282	56750.6	60839.0	304.059	104.33	113.26	314
520.000	.11736	8.521	.009938	42.056	58877.6	63137.9	308.606	107.74	116.60	321
540.000	.11283	8.863	.009539	43.819	61071.3	65502.9	313.068	111.06	119.87	327
560.000	.10864	9.205	.009172	45.571	63330.0	67932.4	317.486	114.30	123.06	333
580.000	.10476	9.545	.008834	47.314	65652.1	70424.8	321.858	117.44	126.16	339
600.000	.10116	9.885	.008521	49.050	68035.8	72978.4	326.186	120.50	129.18	345
620.000	.09780	10.224	.008231	50.778	70479.3	75591.5	330.471	123.48	132.13	351
640.000	.09467	10.563	.007960	52.501	72981.3	78262.9	334.711	126.37	134.99	356
660.000	.09173	10.901	.007708	54.219	75540.1	80990.7	338.907	129.17	137.77	362
680.000	.08898	11.239	.007471	55.932	78153.9	83773.3	343.060	131.90	140.47	367
700.000	.08638	11.576	.007249	57.641	80821.1	86609.2	347.170	134.55	143.10	372



PROPANE ISOBAR AT P = 6 BAR

T	DEN	VOL	DP/DT	DP/DD	E	H	S	CV	CP
DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	M/SEC
85.526	16.623	.06016	35.3738	1564.612	5509.1	5545.2	82.633	59.28	84.03
90.000	16.521	.06053	33.6714	1487.816	5885.4	5921.7	86.923	59.13	84.26
100.000	16.295	.06137	30.2830	1334.946	6730.1	6766.9	95.827	58.92	84.79
110.000	16.068	.06224	27.3681	1203.244	7580.2	7617.5	103.933	58.83	85.35
120.000	15.840	.06313	24.8326	1088.329	8436.2	8474.1	111.385	58.86	85.96
130.000	15.611	.06406	22.6070	986.979	9298.6	9337.0	118.291	59.01	86.63
140.000	15.382	.06501	20.6383	896.753	10167.9	10206.9	124.738	59.26	87.36
150.000	15.151	.06600	18.8853	815.779	11044.9	11084.5	130.792	59.60	88.17
160.000	14.919	.06703	17.3152	742.574	11930.4	11970.7	136.510	60.04	89.07
170.000	14.684	.06810	15.9016	675.952	12825.3	12866.2	141.939	60.56	90.06
180.000	14.448	.06921	14.6226	614.951	13730.6	13772.1	147.117	61.17	91.16
190.000	14.209	.07038	13.4599	558.783	14647.4	14689.7	152.077	61.86	92.38
200.000	13.966	.07160	12.3982	506.793	15577.2	15620.1	156.849	62.64	93.74
210.000	13.719	.07289	11.4243	458.438	16521.2	16564.9	161.458	63.49	95.25
220.000	13.467	.07425	10.5266	413.265	17481.1	17525.7	165.928	64.41	96.94
230.000	13.209	.07570	9.6951	370.891	18458.9	18504.3	170.278	65.42	98.83
240.000	12.944	.07726	8.9209	331.004	19465.1	19511.4	174.575	66.50	100.94
250.000	12.670	.07893	8.1957	293.336	20497.1	20544.5	178.805	67.66	103.32
260.000	12.384	.08075	7.5122	257.659	21555.0	21603.4	182.971	68.89	106.02
270.000	12.086	.08274	6.8632	223.780	22640.5	22690.1	187.083	70.20	109.11
280.000	11.770	.08496	6.2416	191.524	23756.5	23807.4	191.155	71.58	112.70
281.009	11.737	.08520	6.1802	188.354	23870.9	23922.0	191.564	71.72	113.09
281.009	.29515	3.388	.028462	17.321	37968.3	40001.2	248.784	65.27	80.36
290.000	.28138	3.554	.026583	18.586	38590.6	40722.9	251.312	66.38	80.30
300.000	.26801	3.731	.024902	19.895	39289.9	41528.6	254.043	67.88	80.90
310.000	.25622	3.903	.023501	21.132	40000.6	42342.3	256.711	69.54	81.88
320.000	.24568	4.070	.022299	22.314	40724.8	43167.0	259.329	71.28	83.10
330.000	.23617	4.234	.021251	23.453	41464.3	44004.8	261.907	73.08	84.48
340.000	.22751	4.395	.020322	24.557	42219.8	44857.0	264.451	74.92	85.97
350.000	.21958	4.554	.019490	25.632	42992.1	45724.6	266.965	76.79	87.55
360.000	.21227	4.711	.018740	26.683	43781.8	46608.3	269.455	78.67	89.19
370.000	.20551	4.866	.018056	27.713	44589.0	47508.6	271.921	80.56	90.87
380.000	.19922	5.020	.017431	28.725	45414.0	48425.7	274.367	82.45	92.58
390.000	.19336	5.172	.016855	29.721	46257.2	49360.3	276.794	84.35	94.32
400.000	.18787	5.323	.016323	30.704	47118.5	50312.3	279.204	86.24	96.07
410.000	.18271	5.473	.015828	31.675	47998.0	51281.8	281.598	88.12	97.83
420.000	.17786	5.622	.015367	32.635	48895.6	52269.0	283.977	89.99	99.59
430.000	.17329	5.771	.014936	33.585	49811.3	53273.8	286.341	91.84	101.36
440.000	.16896	5.919	.014532	34.527	50745.0	54296.2	288.691	93.69	103.11
450.000	.16486	6.066	.014152	35.461	51696.7	55336.1	291.028	95.51	104.86
460.000	.16097	6.212	.013793	36.388	52666.2	56393.5	293.352	97.32	106.61
470.000	.15728	6.358	.013454	37.309	53653.3	57468.3	295.663	99.12	108.34
480.000	.15376	6.504	.013133	38.225	54658.0	58560.3	297.962	100.89	110.05
490.000	.15040	6.649	.012829	39.135	55680.0	59669.4	300.249	102.64	111.75
500.000	.14720	6.794	.012540	40.040	56719.0	60795.2	302.523	104.38	113.44
520.000	.14120	7.082	.012002	41.838	58848.2	63097.4	307.037	107.78	116.76
540.000	.13570	7.369	.011512	43.622	61043.8	65465.4	311.505	111.10	120.01
560.000	.13063	7.655	.011063	45.392	63304.2	67897.5	315.927	114.33	123.18
580.000	.12593	7.941	.010650	47.152	65627.8	70392.2	320.304	117.48	126.27
600.000	.12158	8.225	.010268	48.902	68012.9	72948.0	324.636	120.53	129.28
620.000	.11752	8.509	.009915	50.645	70457.9	75563.2	328.932	123.50	132.22
640.000	.11374	8.792	.009586	52.380	72964.1	78236.3	333.166	126.39	135.07

90.000	16.522	.06053	33.6823	1488.785	5884.6	5927.0	86.915	59.13	84.26	2193
100.000	16.296	.06137	30.2933	1335.867	7279.2	6772.2	95.819	58.92	84.79	2087
110.000	16.068	.06223	27.3780	1204.125	7579.2	7622.8	103.925	58.83	85.35	1990
120.000	15.841	.06313	24.8421	1089.178	8435.1	8479.3	111.376	58.86	85.96	1899
130.000	15.612	.06405	22.6162	987.802	9297.4	9342.2	118.282	59.01	86.63	1813
140.000	15.383	.06501	20.6472	897.553	10166.6	10212.1	124.728	59.26	87.36	1732
150.000	15.152	.06600	18.8939	816.561	11043.4	11089.6	130.782	59.60	88.17	1655
160.000	14.920	.06702	17.3237	743.340	11928.8	11975.7	136.500	60.04	89.06	1581
170.000	14.686	.06809	15.9099	676.706	12823.5	12871.1	141.928	60.56	90.05	1510
180.000	14.450	.06921	14.6308	615.696	13728.6	13777.0	147.105	61.17	91.15	1442
190.000	14.210	.07037	13.4680	559.520	14645.2	14694.4	152.065	61.86	92.37	1376
200.000	13.968	.07159	12.4063	507.525	15574.7	15624.8	156.837	62.64	93.72	1312
210.000	13.721	.07288	11.4323	459.167	16518.4	16569.4	161.445	63.49	95.23	1249
220.000	13.470	.07424	10.5346	413.994	17478.1	17530.0	165.914	64.41	96.92	1188
230.000	13.212	.07569	9.7031	371.622	18455.5	18508.5	170.263	65.42	98.80	1128
240.000	12.947	.07724	8.9290	331.740	19461.2	19515.3	174.559	66.50	100.91	1068
250.000	12.673	.07891	8.2040	294.080	20492.8	20548.0	178.788	67.66	103.29	1008
260.000	12.388	.08072	7.5208	258.416	21550.1	21606.6	182.952	68.89	105.98	949
270.000	12.090	.08271	6.8722	224.553	22634.8	22692.7	187.062	70.20	109.05	889
280.000	11.775	.08493	6.2511	192.320	23749.9	23809.4	191.132	71.58	112.62	828
286.477	11.560	.08651	5.8602	172.235	24490.4	24550.9	193.755	72.52	115.26	787
286.477	34.358	2.910	.033709	16.967	38219.1	40256.5	248.578	66.73	82.99	218
290.000	33.680	2.969	.032715	17.507	38469.9	40548.3	249.591	67.09	82.71	221
300.000	31.951	3.130	.030362	18.944	39183.9	41374.7	252.392	68.39	82.69	227
310.000	30.452	3.284	.028469	20.278	39905.6	42204.3	255.112	69.93	83.29	234
320.000	29.129	3.433	.026882	21.540	40638.7	43041.8	257.771	71.61	84.26	239
330.000	27.946	3.578	.025518	22.746	41385.4	43890.3	260.382	73.35	85.45	245
340.000	26.878	3.721	.024325	23.907	42147.1	44751.5	262.952	75.16	86.80	250
350.000	25.906	3.860	.023268	25.031	42924.7	45626.8	265.489	76.99	88.27	255
360.000	25.015	3.998	.022322	26.126	43718.9	46517.2	267.998	78.85	89.82	259
370.000	24.194	4.133	.021467	27.194	44530.1	47423.4	270.480	80.72	91.43	264
380.000	23.433	4.267	.020689	28.241	45358.8	48346.0	272.941	82.59	93.08	268
390.000	22.726	4.400	.019976	29.268	46205.1	49285.3	275.380	84.47	94.77	272
400.000	22.066	4.532	.019321	30.279	47069.2	50241.5	277.801	86.35	96.48	276
410.000	21.448	4.662	.018714	31.275	47951.3	51214.9	280.204	88.22	98.20	280
420.000	20.868	4.792	.018151	32.259	48851.2	52205.6	282.591	90.08	99.93	284
430.000	20.322	4.921	.017626	33.231	49769.1	53213.6	284.963	91.93	101.66	288
440.000	19.806	5.049	.017135	34.192	50704.6	54238.9	287.320	93.77	103.40	292
450.000	19.319	5.176	.016675	35.145	51658.1	55281.5	289.663	95.59	105.13	296
460.000	18.857	5.303	.016242	36.089	52629.2	56341.4	291.993	97.39	106.85	299
470.000	18.418	5.429	.015833	37.026	53617.9	57418.5	294.309	99.18	108.56	303
480.000	18.001	5.555	.015447	37.956	54624.0	58512.7	296.612	100.95	110.26	306
490.000	17.604	5.681	.015082	38.880	55647.3	59623.8	298.903	102.70	111.95	310
500.000	17.225	5.806	.014735	39.799	56687.7	60751.7	301.182	104.43	113.62	313
520.000	16.517	6.055	.014092	41.620	58819.1	63057.3	305.703	107.83	116.92	319
540.000	15.867	6.302	.013508	43.424	61016.7	65428.2	310.176	111.14	120.15	326
560.000	15.270	6.549	.012973	45.214	63278.9	67863.0	314.603	114.37	123.31	332
580.000	14.718	6.794	.012483	46.990	65603.8	70360.0	318.984	117.51	126.39	338
600.000	14.206	7.039	.012030	48.756	67990.3	72917.9	323.319	120.56	129.39	344
620.000	13.730	7.284	.011612	50.512	70436.5	75535.0	327.610	123.53	132.31	350
640.000	13.285	7.527	.011223	52.259	72940.8	78209.9	331.855	126.41	135.15	355
660.000	12.870	7.770	.010860	54.000	75501.6	80940.8	336.057	129.22	137.92	361
680.000	12.480	8.013	.010521	55.733	78117.2	83726.3	340.214	131.94	140.61	367
700.000	12.114	8.255	.010204	57.461	80785.2	86564.8	344.328	134.58	143.22	372



Table 30. Continued.

## PROPANE ISOBAR AT P = 8 BAR

T DEG K	OEN MOL/L	VOL L/MOL	DP/OT BAR/K	OP/OO BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
85.544	16.623	.06016	35.3888	1566.278	5509.2	5557.4	82.635	59.28	84.03	2243
90.000	16.523	.06052	33.6931	1489.755	5883.9	5932.3	86.907	59.13	84.26	2193
100.000	16.296	.06136	30.3036	1336.788	6728.4	6777.4	95.810	58.92	84.78	2086
110.000	16.069	.06223	27.3878	1205.007	7578.3	7628.1	103.916	58.83	85.35	1991
120.000	15.842	.06312	24.8516	1090.027	8434.0	8484.5	111.367	58.86	85.96	1899
130.000	15.613	.06405	22.6253	988.624	9296.1	9347.4	118.273	59.01	86.62	1814
140.000	15.384	.06500	20.6561	898.353	10165.2	10217.2	124.718	59.26	87.35	1732
150.000	15.153	.06599	18.9026	817.343	11041.9	11094.7	130.772	59.60	88.16	1655
160.000	14.921	.06702	17.3322	744.107	11927.1	11980.7	136.489	60.04	89.05	1582
170.000	14.687	.06809	15.9183	677.460	12821.6	12876.1	141.917	60.56	90.04	1511
180.000	14.451	.06920	14.6390	616.440	13726.5	13781.9	147.094	61.17	91.14	1443
190.000	14.212	.07036	13.4761	560.257	14642.9	14699.2	152.053	61.86	92.36	1377
200.000	13.970	.07158	12.4143	508.257	15572.2	15629.4	156.824	62.64	93.71	1313
210.000	13.723	.07287	11.4402	459.896	16515.6	16573.9	161.432	63.49	95.22	1250
220.000	13.472	.07423	10.5426	414.723	17475.0	17534.4	165.900	64.42	96.90	1189
230.000	13.215	.07567	9.7112	372.353	18452.1	18512.6	170.248	65.42	98.78	1129
240.000	12.950	.07722	8.9371	332.476	19457.4	19519.1	174.543	66.50	100.88	1069
250.000	12.676	.07889	8.2124	294.824	20488.5	20551.6	178.770	67.66	103.25	1010
260.000	12.392	.08070	7.5294	259.172	21545.2	21609.7	182.933	68.89	105.93	950
270.000	12.094	.08268	6.8811	225.325	22629.2	22695.4	187.041	70.20	108.99	890
280.000	11.780	.08489	6.2606	193.114	23743.4	23811.3	191.108	71.59	112.54	829
290.000	11.444	.08738	5.6606	162.377	24892.3	24962.2	195.154	73.04	116.74	767
291.395	11.395	.08776	5.5781	158.197	25055.6	25125.8	195.718	73.25	117.39	756



90.000	16.524	.06052	33.7148	1491.695	582.24	5942.9	86.890	59.13	84.25	2195
100.000	16.298	.06136	30.3242	1338.630	6726.7	6788.0	95.793	58.92	84.78	2090
110.000	16.071	.06222	27.4075	1206.769	7576.3	7638.6	103.898	58.83	85.34	1992
120.000	15.844	.06312	24.8705	1091.725	8431.9	8495.0	111.349	58.87	85.95	1901
130.000	15.615	.06404	22.6436	990.268	9293.7	9357.7	118.254	59.01	86.62	1815
140.000	15.386	.06499	20.6738	899.954	10162.5	10227.5	124.699	59.26	87.35	1734
150.000	15.156	.06598	18.9199	818.906	11038.9	11104.9	130.752	59.60	88.15	1657
160.000	14.924	.06701	17.3491	745.639	11923.8	11990.8	136.468	60.04	89.04	1583
170.000	14.690	.06807	15.9349	678.968	12817.9	12886.0	141.895	60.57	90.03	1512
180.000	14.454	.06918	14.6553	617.928	13722.4	13791.6	147.071	61.17	91.12	1444
190.000	14.216	.07034	13.4923	561.730	14638.4	14708.8	152.029	61.87	92.33	1378
200.000	13.974	.07156	12.4303	509.720	15567.2	15638.7	156.799	62.64	93.68	1314
210.000	13.728	.07284	11.4562	461.354	16510.1	16583.0	161.406	63.49	95.19	1252
220.000	13.477	.07420	10.4585	416.179	17460.9	17543.1	165.872	64.42	96.86	1191
230.000	13.220	.07564	9.47272	373.814	18445.2	18520.9	170.218	65.42	98.73	1131
240.000	12.956	.07718	8.49534	333.947	19449.7	19526.9	174.511	66.51	100.83	1071
250.000	12.683	.07884	8.2289	296.311	20479.8	20558.7	178.736	67.66	103.18	1012
260.000	12.403	.08065	7.5464	260.682	21535.4	21616.0	182.895	68.90	105.84	952
270.000	12.103	.08262	6.8989	226.867	22618.0	22700.6	186.999	70.21	108.87	893
280.000	11.790	.08481	6.2794	194.698	23730.4	23815.2	191.062	71.59	112.38	832
290.000	11.456	.08729	5.6809	164.019	24877.0	24964.3	195.101	73.04	116.52	770
300.000	11.095	.09013	5.0955	134.674	26064.5	26154.6	199.142	74.57	121.56	705
300.011	11.095	.09013	5.0949	134.643	26065.8	26155.9	199.147	74.57	121.57	705
300.011	.49227	2.031	.050667	15.788	38821.2	40852.6	248.134	70.54	90.67	214
310.000	.46329	2.158	.046164	17.525	39589.8	41748.3	251.071	71.42	88.99	222
320.000	.43903	2.278	.042757	19.086	40358.0	42635.7	253.888	72.75	88.65	229
330.000	.41815	2.391	.040009	20.530	41132.1	43523.6	256.620	74.28	88.99	236
340.000	.39983	2.501	.037712	21.888	41915.9	44417.0	259.287	75.93	89.75	242
350.000	.38354	2.607	.035746	23.179	42712.1	45319.4	261.903	77.65	90.77	247
360.000	.36888	2.711	.034035	24.417	43522.1	46232.9	264.477	79.42	91.97	253
370.000	.35558	2.812	.032524	25.611	44347.0	47159.2	267.014	81.22	93.30	258
380.000	.34342	2.912	.031175	26.768	45187.5	48099.4	269.521	83.04	94.74	263
390.000	.33224	3.010	.029961	27.895	46044.3	49054.2	272.002	84.87	96.24	267
400.000	.32190	3.107	.028860	28.994	46917.8	50024.4	274.458	86.70	97.79	272
410.000	.31230	3.202	.027854	30.071	47808.2	51010.3	276.892	88.54	99.39	276
420.000	.30335	3.297	.026931	31.128	48715.7	52012.2	279.306	90.37	101.01	280
430.000	.29497	3.390	.026079	32.166	49640.3	53030.4	281.702	92.20	102.64	284
440.000	.28712	3.483	.025289	33.190	50582.3	54065.2	284.081	94.01	104.29	288
450.000	.27972	3.575	.024554	34.199	51541.4	55116.4	286.443	95.81	105.95	292
460.000	.27274	3.666	.023867	35.195	52517.8	56184.2	288.790	97.60	107.61	296
470.000	.26615	3.757	.023224	36.181	53511.3	57268.6	291.122	99.37	109.26	300
480.000	.25989	3.848	.022620	37.156	54521.8	58369.5	293.440	101.13	110.91	303
490.000	.25396	3.938	.022052	38.122	55549.3	59486.9	295.743	102.86	112.55	307
500.000	.24832	4.027	.021515	39.079	56593.4	60620.6	298.034	104.58	114.19	311
510.000	.24301	4.205	.020926	40.072	576731.8	62936.7	302.575	107.96	117.41	317
520.000	.23823	4.382	.019634	42.839	60935.4	65316.9	307.066	111.26	120.59	324
530.000	.23394	4.557	.018824	44.684	63202.9	67759.8	311.508	114.47	123.69	330
540.000	.22935	4.731	.018085	46.511	65532.8	70264.3	315.902	117.60	126.73	337
550.000	.22537	4.905	.017406	48.322	67923.5	72828.7	320.248	120.64	129.70	343
560.000	.22169	5.078	.016781	50.119	70373.4	75451.6	324.548	123.61	132.59	349
570.000	.21823	5.251	.016202	51.903	72881.2	78131.8	328.803	126.48	135.41	354
580.000	.21492	5.422	.015665	53.677	75445.1	80867.5	333.012	129.28	138.15	360
590.000	.21177	5.594	.015165	55.442	78063.6	83657.4	337.176	131.99	140.82	366
600.000	.20877	5.765	.014697	57.198	80735.1	86500.0	341.295	134.63	143.42	371

Table 30. Continued.

PROPANE ISOBAR AT P = 12 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DO BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
85.581	16.625	.06015	35.4184	1569.584	5509.6	5581.7	82.639	59.28	84.02	2246
90.000	16.525	.06051	33.7364	1493.634	5880.9	5953.5	86.874	59.13	84.25	2196
100.000	16.299	.06135	30.3448	1340.471	6725.0	6798.6	95.776	58.92	84.77	2091
110.000	16.073	.06222	27.4272	1208.532	7574.4	7649.1	103.881	58.83	85.33	1993
120.000	15.845	.06311	24.8895	1093.422	8429.7	8505.4	111.331	58.87	85.94	1902
130.000	15.617	.06403	22.6619	991.913	9291.3	9368.1	118.235	59.01	86.61	1816
140.000	15.388	.06498	20.6917	901.565	10159.8	10237.8	124.679	59.26	87.34	1735
150.000	15.158	.06597	18.9373	820.469	11035.9	11115.1	130.731	59.60	88.14	1658
160.000	14.927	.06699	17.3661	747.172	11920.4	12000.8	136.447	60.04	89.03	1585
170.000	14.693	.06806	15.9515	680.475	12814.2	12895.9	141.873	60.57	90.01	1514
180.000	14.458	.06917	14.6717	619.415	13718.4	13801.4	147.048	61.17	91.10	1446
190.000	14.219	.07033	13.5084	563.202	14633.9	14718.3	152.006	61.87	92.31	1380
200.000	13.978	.07154	12.4463	511.182	15562.2	15648.1	156.774	62.64	93.66	1316
210.000	13.732	.07282	11.4721	462.810	16504.6	16592.0	161.379	63.49	95.16	1254
220.000	13.482	.07417	10.5744	417.635	17462.7	17551.8	165.844	64.42	96.83	1193
230.000	13.225	.07561	9.7433	375.278	18438.4	18529.1	170.188	65.42	98.69	1133
240.000	12.962	.07715	8.9696	335.416	19442.1	19534.7	174.479	66.51	100.77	1073
250.000	12.690	.07880	8.2455	297.796	20471.3	20565.8	178.701	67.67	103.11	1014
260.000	12.407	.08060	7.5635	262.189	21525.7	21622.4	182.857	68.90	105.75	955
270.000	12.112	.08256	6.9166	228.405	22606.9	22706.0	186.958	70.21	108.76	895
280.000	11.801	.08474	6.2981	196.278	23717.6	23819.2	191.015	71.59	112.23	835
290.000	11.469	.08719	5.7010	165.656	24861.8	24966.5	195.049	73.05	116.31	773
300.000	11.110	.09001	5.1177	136.387	26046.3	26154.3	199.081	74.58	121.25	709
307.440	10.820	.09243	4.6873	115.391	26959.7	27070.6	202.102	75.76	125.77	659
307.440	.59502	1.681	.063088	14.947	39135.9	41152.7	247.906	72.76	95.89	211
310.000	.58455	1.711	.061283	15.466	39344.0	41396.8	248.697	72.85	94.88	213
320.000	.54894	1.822	.055658	17.312	40147.0	42333.0	251.670	73.72	92.72	222
330.000	.51946	1.925	.051414	18.961	40946.0	43256.1	254.510	75.02	92.07	229
340.000	.49426	2.023	.048008	20.478	41749.0	44176.9	257.259	76.52	92.18	236
350.000	.47228	2.117	.045175	21.900	42560.5	45101.3	259.939	78.14	92.76	242
360.000	.45281	2.208	.042761	23.247	43383.1	46033.2	262.564	79.84	93.65	248
370.000	.43536	2.297	.040667	24.534	44218.6	46974.9	265.144	81.58	94.74	254
380.000	.41956	2.383	.038824	25.772	45068.3	47928.4	267.687	83.35	95.98	259
390.000	.40515	2.468	.037184	26.970	45933.1	48894.9	270.197	85.15	97.33	264
400.000	.39193	2.552	.035712	28.133	46813.5	49875.3	272.679	86.95	98.76	269
410.000	.37972	2.634	.034379	29.266	47710.0	50870.3	275.136	88.76	100.25	273
420.000	.36839	2.715	.033165	30.374	48623.0	51880.4	277.570	90.57	101.78	278
430.000	.35785	2.795	.032052	31.459	49552.7	52906.1	279.983	92.38	103.35	282
440.000	.34799	2.874	.031026	32.525	50499.0	53947.4	282.377	94.18	104.93	286
450.000	.33874	2.952	.030077	33.573	51462.3	55004.7	284.753	95.97	106.53	290
460.000	.33005	3.030	.029195	34.605	52442.3	56078.1	287.112	97.74	108.14	294
470.000	.32185	3.107	.028372	35.623	53439.2	57167.6	289.455	99.50	109.75	298
480.000	.31411	3.184	.027603	36.629	54452.9	58273.3	291.783	101.25	111.37	302
490.000	.30677	3.260	.026881	37.623	55483.3	59395.0	294.096	102.98	112.98	305
500.000	.29981	3.335	.026201	38.607	56530.2	60532.7	296.394	104.69	114.58	309
520.000	.28688	3.486	.024955	40.548	58673.3	62856.2	300.950	108.05	117.76	316
540.000	.27513	3.635	.023837	42.457	60881.1	65242.7	305.453	111.34	120.88	323
560.000	.26438	3.782	.022826	44.340	63152.3	67691.3	309.905	114.54	123.96	329
580.000	.25450	3.929	.021907	46.200	65485.5	70200.7	314.308	117.66	126.97	336
600.000	.24538	4.075	.021067	48.041	67879.0	72769.5	318.562	120.70	129.91	342
620.000	.23693	4.221	.020294	49.855	70374.3	75474.3	322.800	123.74	132.94	348



85.600	16.626	.06015	35.4333	1571.244	5509.7	5593.9	82.641	59.28	84.02	22.47
90.000	16.527	.06051	33.7580	1495.574	5879.4	5984.1	86.857	59.13	84.24	21.98
100.000	16.301	.06135	30.3653	1342.313	6723.3	6809.1	95.759	58.92	84.77	20.92
110.000	16.074	.06221	27.4468	1210.294	7572.5	7659.6	103.863	58.83	85.33	19.95
120.000	15.847	.06310	24.9084	1095.120	847.5	8515.9	111.313	58.87	85.94	19.04
130.000	15.619	.06402	22.6802	993.557	9288.9	9378.5	118.216	59.01	86.60	18.18
140.080	15.391	.06497	20.7095	903.164	10157.1	10248.0	124.660	59.26	87.33	17.37
150.000	15.161	.06596	18.9546	822.032	11032.9	11125.3	130.711	59.60	88.13	16.60
160.000	14.929	.06698	17.3830	748.704	11917.1	12010.9	136.427	60.04	89.01	15.86
170.000	14.696	.06804	15.9681	681.982	12810.6	12905.8	141.852	60.57	90.00	15.15
180.000	14.461	.06915	14.6880	620.903	13714.3	13811.1	147.026	61.18	91.08	14.47
190.000	14.223	.07031	13.5245	564.674	14629.5	14727.9	151.982	61.87	92.29	13.82
200.000	13.982	.07152	12.4623	512.643	15557.3	15657.4	156.749	62.64	93.63	13.18
210.000	13.736	.07280	11.4880	464.266	16499.1	16601.0	161.353	63.49	95.13	12.55
220.000	13.486	.07415	10.5903	419.089	17456.7	17560.5	165.816	64.42	96.79	11.94
230.000	13.231	.07558	9.7592	376.736	18431.6	18537.4	170.158	65.43	98.64	11.34
240.000	12.968	.07711	8.9858	336.884	19434.5	19542.5	174.448	66.51	100.71	10.75
250.000	12.697	.07876	8.2620	299.278	20462.7	20573.0	178.667	67.67	103.04	10.16
260.000	12.415	.08055	7.5804	263.693	21516.0	21628.8	182.820	68.90	105.66	9.57
270.000	12.121	.08250	6.9343	229.940	22595.9	22711.4	186.916	70.21	108.64	8.98
280.000	11.811	.08467	6.3168	197.854	23704.8	23823.3	190.970	71.60	112.08	8.38
290.000	11.481	.08710	5.7211	167.286	24846.8	24968.8	194.996	73.05	116.10	7.76
300.000	11.124	.08989	5.1398	138.091	26028.3	26154.1	199.021	74.58	120.96	7.12
310.000	10.732	.09318	4.5639	110.110	27259.4	27389.9	203.077	76.18	127.10	6.45
314.009	10.562	.09468	4.3319	99.189	27770.5	27903.1	204.724	76.85	130.10	6.17
314.009	7.0134	.076505	14.076	39401.4	41397.5	247.699	74.82	101.37	207	
320.000	.67133	.071237	15.378	39909.6	41995.0	249.584	74.97	98.40	213	
330.000	.62981	.064664	17.293	40742.3	42985.2	252.569	75.89	96.01	222	
340.000	.59559	.059677	19.005	41569.5	43920.1	255.420	77.19	95.15	230	
350.000	.56647	.055673	20.578	42399.5	44870.9	258.176	78.68	95.11	237	
360.000	.54114	.052347	22.048	43236.9	45824.0	260.861	80.29	95.57	243	
370.000	.51875	.049516	23.438	44084.6	46783.4	263.490	81.96	96.35	249	
380.000	.49872	.047064	24.764	44944.5	47751.7	266.072	83.69	97.35	255	
390.000	.48062	.044910	26.038	45818.1	48731.0	268.616	85.44	98.52	260	
400.000	.46413	.042996	27.268	46706.1	49722.5	271.126	87.21	99.80	266	
420.000	.43507	.041279	28.461	47609.4	50727.3	273.607	89.00	101.17	270	
430.000	.42214	.039727	29.622	48528.3	51746.2	276.062	90.78	102.61	275	
440.000	.41011	.038314	30.755	49463.2	52779.6	278.494	92.57	104.09	280	
450.000	.39888	.037020	31.864	50414.4	53828.1	280.904	94.35	105.60	284	
460.000	.38834	.035829	32.952	51381.9	54891.7	283.294	96.12	107.14	288	
470.000	.37844	.034728	34.021	52365.9	55970.9	285.666	97.88	108.70	292	
480.000	.36910	.033705	35.109	53366.3	57065.8	288.020	99.63	110.26	296	
490.000	.36028	.032752	36.199	54383.3	58176.3	290.358	101.37	111.84	300	
500.000	.35193	.031862	37.132	55416.7	59302.5	292.681	103.09	113.41	304	
520.000	.33646	.031026	38.143	56466.4	60444.5	294.988	104.79	114.98	308	
540.000	.32244	.029500	40.132	58614.4	62775.4	299.558	108.14	118.10	315	
560.000	.30966	.028138	42.084	60826.6	65168.4	304.073	111.42	121.19	322	
580.000	.29793	.026912	44.004	63101.6	67622.7	308.536	114.61	124.23	328	
600.000	.28713	.025802	45.897	65438.0	70137.1	312.947	117.73	127.21	335	
620.000	.27714	.024790	47.668	67834.6	72710.5	317.309	120.76	130.12	341	
640.000	.26786	.023862	49.618	70289.9	75341.6	321.622	123.71	132.97	347	
660.000	.25923	.023008	51.452	72802.4	78029.0	325.888	126.58	135.75	353	
680.000	.25116	.022218	53.270	75370.6	80771.3	330.107	129.36	138.46	359	
700.000	.24360	.021485	55.075	77993.0	83567.1	334.280	132.07	141.11	365	
		.020803	56.869	80668.0	86415.0	338.408	134.70	143.68	370	

Table 30. Continued.

PROPANE ISOBAR AT P = 16 BAR

DEG K	T	OEN	VOL	DP/DT	DP/DD	E	H	S	CV	CP	H
		MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
85.618	16.627	16.627	.06014	35.4481	1572.904	5509.9	5606.1	82.643	59.28	84.02	2248
90.000	16.528	16.528	.06950	33.7797	1497.515	5877.9	5974.7	86.841	59.13	84.24	2199
100.000	16.302	16.302	.06134	30.3858	1344.155	6721.6	6819.7	95.742	58.92	84.76	2094
110.000	16.076	16.076	.06220	27.4665	1212.057	7570.6	7670.1	103.845	58.83	85.32	1996
120.000	15.849	15.849	.06310	24.9273	1096.818	8425.4	8526.3	111.295	58.87	85.93	1905
130.000	15.621	15.621	.06401	22.6985	995.201	9286.4	9388.9	118.198	59.01	86.59	1819
140.000	15.393	15.393	.06497	20.7272	904.764	10154.4	10258.3	124.641	59.26	87.32	1738
150.000	15.163	15.163	.06595	18.9719	823.594	11029.9	11135.4	130.691	59.61	88.12	1661
160.000	14.932	14.932	.06697	17.3999	750.236	11913.8	12021.0	136.406	60.04	89.00	1588
170.000	14.699	14.699	.06803	15.9847	683.489	12806.9	12915.8	141.830	60.57	89.98	1517
180.000	14.464	14.464	.06914	14.7043	622.389	13710.3	13820.9	147.003	61.18	91.07	1449
190.000	14.226	14.226	.07029	13.5406	566.146	14625.0	14737.5	151.958	61.87	92.27	1383
200.000	13.986	13.986	.07150	12.4782	514.104	15552.3	15666.7	156.724	62.64	93.61	1319
210.000	13.741	13.741	.07278	11.5039	465.721	16493.7	16610.1	161.327	63.49	95.10	1257
220.000	13.491	13.491	.07412	10.6062	420.543	17450.6	17569.2	165.788	64.42	96.75	1196
230.000	13.236	13.236	.07555	9.7752	378.193	18424.9	18545.8	170.129	65.43	98.60	1136
240.000	12.974	12.974	.07708	9.0019	338.350	19427.0	19550.3	174.416	66.51	100.66	1077
250.000	12.703	12.703	.07872	8.2784	300.759	20454.3	20580.2	178.633	67.67	102.97	1018
260.000	12.423	12.423	.08050	7.5974	265.196	21505.4	21635.2	182.783	68.91	105.57	959
270.000	12.129	12.129	.08244	6.9519	231.472	22584.9	22716.8	186.875	70.22	108.53	900
280.000	11.821	11.821	.08460	6.3353	199.426	23692.1	23827.5	190.924	71.60	111.93	840
290.000	11.493	11.493	.08701	5.7410	168.910	24832.0	24971.2	194.945	73.06	115.90	779
300.000	11.139	11.139	.08978	5.1616	139.787	26010.5	26154.1	198.961	74.59	120.67	716
310.000	10.750	10.750	.09302	4.5886	111.905	27237.5	27386.3	203.006	76.19	126.66	649
319.925	10.315	10.315	.09694	4.0146	85.275	28519.5	28674.6	207.100	77.85	134.67	578
319.925	.81184	1.232	1.232	.091025	13.182	39627.2	41598.0	247.495	76.76	107.27	204
320.000	.81132	1.233	1.233	.090924	13.201	39634.0	41606.1	247.521	76.76	107.20	204
330.000	.75183	1.330	1.330	.080377	15.495	40515.9	42644.0	250.715	76.96	101.31	215
340.000	.70533	1.418	1.418	.073057	17.451	41374.7	43643.2	253.698	77.96	98.87	224
350.000	.66703	1.499	1.499	.067448	19.203	42227.5	44626.2	256.548	79.29	97.92	231
360.000	.63447	1.576	1.576	.062928	20.814	43082.5	45604.3	259.303	80.78	97.79	239
370.000	.60618	1.650	1.650	.059166	22.318	43944.3	46583.8	261.987	82.38	98.17	245
380.000	.58119	1.721	1.721	.055962	23.741	44815.8	47568.8	264.613	84.04	98.88	251
390.000	.55885	1.789	1.789	.053186	25.097	45699.2	48562.2	267.194	85.75	99.82	257
400.000	.53867	1.856	1.856	.050748	26.398	46595.6	49565.8	269.735	87.48	100.93	262
410.000	.52030	1.922	1.922	.048581	27.654	47506.1	50581.2	272.242	89.24	102.16	267
420.000	.50345	1.986	1.986	.046638	28.871	48431.4	51609.4	274.719	91.00	103.48	272
430.000	.48793	2.049	2.049	.044882	30.054	49371.9	52651.1	277.171	92.76	104.87	277
440.000	.47354	2.112	2.112	.043284	31.208	50328.1	53707.0	279.598	94.53	106.31	282
450.000	.46014	2.173	2.173	.041821	32.337	51300.2	54777.4	282.003	96.28	107.78	286
460.000	.44763	2.234	2.234	.040475	33.443	52288.3	55862.6	284.388	98.03	109.28	290
470.000	.43591	2.294	2.294	.039230	34.529	53292.5	56963.0	286.755	99.77	110.79	294
480.000	.42489	2.354	2.354	.038075	35.597	54312.8	58078.5	289.103	101.49	112.32	298
490.000	.41450	2.413	2.413	.036999	36.649	55349.3	59209.5	291.435	103.20	113.86	302
500.000	.40468	2.471	2.471	.035993	37.687	56401.9	60355.7	293.751	104.90	115.39	306
520.000	.38655	2.587	2.587	.034164	39.725	58555.2	62694.3	298.337	108.24	118.46	313
540.000	.37018	2.701	2.701	.032540	41.719	60771.7	65094.0	302.864	111.50	121.50	321
560.000	.35528	2.815	2.815	.031084	43.676	63050.6	67554.1	307.337	114.68	124.50	327
580.000	.34165	2.927	2.927	.029770	45.603	65390.4	70073.7	311.758	117.79	127.45	334
600.000	.32911	3.038	3.038	.028576	47.503	67790.1	72651.6	316.127	120.82	130.34	340
620.000	.31754	3.149	3.149	.027485	49.341	70292.5	75302.5	320.455	123.86	133.33	346



85.637	16.628	.06014	35.4630	1574.564	5510.1	5618.3	82.645	59.28	84.01	2249
90.000	16.529	.06050	33.8013	1499.455	5876.5	5985.4	86.824	59.13	84.23	2200
100.000	16.304	.06134	30.4064	1345.997	6719.9	6830.3	95.725	58.92	84.76	2095
110.000	16.078	.06220	27.4861	1213.820	7568.7	7680.6	103.828	58.83	85.32	1997
120.000	15.851	.06309	24.9462	1098.516	8423.2	8536.8	111.277	58.87	85.92	1906
130.000	15.623	.06401	22.7168	996.845	9284.0	9399.2	118.179	59.01	86.58	1821
140.000	15.395	.06496	20.7450	906.363	10151.7	10268.6	124.621	59.26	87.31	1740
150.000	15.166	.06594	18.9891	825.157	11026.9	11145.6	130.671	59.61	88.11	1663
160.000	14.935	.06696	17.4168	751.767	11910.5	12031.0	136.385	60.04	88.99	1589
170.000	14.702	.06802	16.0012	684.995	12803.3	12925.7	141.808	60.57	89.96	1518
180.000	14.467	.06912	14.7206	623.876	13706.2	13830.7	146.981	61.18	91.05	1451
190.000	14.230	.07027	13.5567	567.617	14620.5	14747.0	151.935	61.87	92.25	1385
200.000	13.989	.07148	12.4942	515.565	15547.4	15676.1	156.700	62.64	93.58	1321
210.000	13.745	.07275	11.5197	467.175	16488.2	16619.2	161.301	63.49	95.07	1259
220.000	13.496	.07410	10.6221	421.995	17444.5	17577.9	165.760	64.42	96.72	1198
230.000	13.241	.07552	9.7911	379.649	18418.1	18554.1	170.099	65.43	98.55	1138
240.000	12.980	.07704	9.0180	339.814	19419.5	19558.1	174.384	66.51	100.60	1079
250.000	12.710	.07868	8.2948	302.238	20445.8	20587.4	178.599	67.67	102.90	1020
260.000	12.430	.08045	7.6142	266.695	21496.9	21641.7	182.746	68.91	105.49	962
270.000	12.138	.08239	6.9694	233.000	22574.0	22722.3	186.835	70.22	108.42	903
280.000	11.831	.08453	6.3538	200.993	23679.6	23831.7	190.879	71.60	111.78	843
290.000	11.504	.08692	5.7607	170.529	24817.3	24973.7	194.893	73.06	115.70	782
300.000	11.153	.08966	5.1832	141.475	25992.9	26154.3	198.902	74.59	120.39	719
310.000	10.768	.09287	4.6130	113.689	27215.9	27383.1	202.935	76.19	126.24	653
320.000	10.335	.09676	4.0389	86.998	28501.8	28676.0	207.044	77.87	134.04	582
325.322	10.077	.09924	3.7262	73.151	29220.9	29399.5	209.288	78.79	139.60	542
325.322	.92718	1.079	.106780	12.266	39819.4	41760.8	247.286	78.62	113.80	200
330.000	.88976	1.124	.099621	13.511	40258.0	42281.0	248.873	78.37	108.99	206
340.000	.82568	1.211	.088644	15.792	41160.7	43340.7	252.037	78.88	103.69	216
350.000	.77526	1.290	.080776	17.763	42042.6	44364.4	255.005	79.96	101.36	225
360.000	.73362	1.363	.074675	19.537	42918.8	45372.4	257.844	81.32	100.41	233
370.000	.69817	1.432	.069728	21.171	43797.0	46375.1	260.592	82.82	100.25	241
380.000	.66733	1.499	.065596	22.699	44681.7	47379.0	263.269	84.42	100.59	247
390.000	.64009	1.562	.062069	24.144	45575.9	48388.0	265.890	86.07	101.26	253
400.000	.61572	1.624	.059008	25.522	46481.6	49405.0	268.465	87.77	102.16	259
410.000	.59370	1.684	.056316	26.844	47400.0	50431.8	271.000	89.49	103.23	264
420.000	.57365	1.743	.053922	28.119	48332.1	51469.9	273.502	91.22	104.42	270
430.000	.55526	1.801	.051774	29.354	49278.7	52520.4	275.974	92.96	105.70	275
440.000	.53830	1.858	.049832	30.555	50240.3	53584.1	278.419	94.71	107.05	279
450.000	.52259	1.914	.048064	31.726	51217.1	54661.5	280.840	96.45	108.44	284
460.000	.50796	1.969	.046445	32.870	52209.5	55753.1	283.239	98.18	109.88	288
470.000	.49429	2.023	.044955	33.992	53217.6	56859.2	285.618	99.91	111.34	293
480.000	.48147	2.077	.043577	35.092	54241.5	57980.1	287.978	101.62	112.82	297
490.000	.46942	2.130	.042299	36.174	55281.3	59115.8	290.319	103.32	114.32	301
500.000	.45806	2.183	.041107	37.239	56336.9	60266.5	292.644	105.01	115.82	305
520.000	.43716	2.288	.038950	39.326	58495.4	62612.9	297.245	108.33	118.83	312
540.000	.41832	2.390	.037043	41.362	60716.5	65019.4	301.786	111.58	121.82	320
560.000	.40124	2.492	.035343	43.358	62999.3	67485.5	306.270	114.76	124.78	326
580.000	.38564	2.593	.033813	45.317	65342.7	70010.3	310.699	117.85	127.69	333
600.000	.37133	2.693	.032427	47.247	67745.4	72592.9	315.077	120.87	130.56	340
620.000	.35814	2.792	.031164	49.151	70206.2	75232.2	319.403	123.81	133.36	346
640.000	.34593	2.891	.030007	51.033	72723.5	77926.9	323.681	126.67	136.10	352
660.000	.33458	2.989	.028942	52.895	75296.1	80675.9	327.910	129.45	138.78	358
680.000	.32401	3.086	.027957	54.740	77922.5	83477.8	332.092	132.15	141.40	364
700.000	.31413	3.183	.027044	56.570	80601.2	86331.3	336.228	134.77	143.94	370



Table 30. Continued.

## PROPANE ISOBAR AT P = 20 BAR

DEG K	T	DEN MOL/L	VOL L/MOL	OP/DT BAR/K	OP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	M M/SEC
85.856	16.629	0.6014	35.4778	1576.224	5510.2	5630.5	82.646	59.27	84.01	2250	
90.000	16.531	0.6049	33.8229	1501.396	5875.0	5996.0	86.808	59.13	84.23	2202	
100.000	16.305	0.6133	30.4269	1347.840	6718.2	6840.8	95.708	58.92	84.75	2096	
110.000	16.079	0.6219	27.5057	1215.583	7566.7	7691.1	103.810	58.83	85.31	1999	
120.000	15.853	0.6308	24.9650	1100.214	8421.1	8547.2	111.258	58.87	85.92	1908	
130.000	15.625	0.6400	22.7350	998.489	9281.6	9409.6	118.160	59.01	86.58	1822	
140.000	15.397	0.6495	20.7627	907.962	10149.0	10278.9	124.602	59.26	87.30	1741	
150.000	15.168	0.6593	19.0064	826.719	11024.0	11155.8	130.651	59.61	88.10	1664	
160.000	14.937	0.6695	17.4337	753.299	11907.2	12041.1	136.364	60.04	88.98	1591	
170.000	14.705	0.6800	16.0178	686.501	12799.6	12935.6	141.787	60.57	89.95	1520	
180.000	14.470	0.6911	14.7369	625.361	13702.2	13840.4	146.958	61.18	91.03	1452	
190.000	14.233	0.7026	13.5728	569.087	14616.1	14756.6	151.911	61.87	92.23	1387	
200.000	13.993	0.7146	12.5101	517.024	15542.5	15685.4	156.675	62.64	93.56	1323	
210.000	13.749	0.7273	11.5356	468.628	16482.8	16628.2	161.275	63.49	95.04	1261	
220.000	13.501	0.7407	10.6379	423.447	17438.5	17586.7	165.733	64.42	96.68	1200	
230.000	13.247	0.7549	9.8070	381.103	18411.4	18562.4	170.070	65.43	98.51	1140	
240.000	12.986	0.7701	9.0341	341.277	19412.0	19566.0	174.353	66.51	100.55	1081	
250.000	12.717	0.7864	8.3112	303.714	20437.4	20594.7	178.565	67.67	102.84	1023	
260.000	12.438	0.8040	7.6310	268.192	21487.4	21648.2	182.709	68.91	105.40	964	
270.000	12.147	0.8233	6.9869	234.526	22563.2	22727.8	186.794	70.22	108.31	905	
280.000	11.841	0.8445	6.3722	202.556	23667.1	23836.0	190.834	71.61	111.64	846	
290.000	11.516	0.8684	5.7804	172.142	24802.7	24976.4	194.843	73.07	115.51	785	
300.000	11.167	0.8955	5.2047	143.155	25975.6	26154.7	198.843	74.60	120.12	723	
310.000	10.785	0.9272	4.6371	115.460	27194.6	27380.1	202.866	76.20	125.83	657	
320.000	10.358	0.9654	4.0672	88.901	28474.7	28667.8	206.958	77.87	133.37	587	
330.000	9.859	1.0143	3.4783	63.229	29842.7	30045.6	211.201	79.61	144.58	510	
330.297	9.842	1.0160	3.4602	62.476	29885.2	30088.4	211.330	79.67	145.01	507	
330.297	1.04819	0.954	1.23935	11.328	39982.0	41890.1	247.061	80.43	121.19	196	
340.000	0.96002	1.042	1.07224	13.992	40921.2	43004.5	250.387	80.01	110.32	209	
350.000	0.89292	1.120	0.96045	16.241	41841.6	44081.4	253.509	80.74	105.68	219	
360.000	0.83961	1.191	0.87809	18.209	42744.0	45126.1	256.452	81.91	103.53	228	
370.000	0.79536	1.257	0.81341	19.990	43641.7	46156.2	259.275	83.30	102.66	236	
380.000	0.75757	1.320	0.76057	21.635	44541.6	47181.6	262.009	84.81	102.52	243	
390.000	0.72462	1.380	0.71622	23.177	45448.0	48208.1	264.676	86.41	102.85	250	
400.000	0.69547	1.438	0.67823	24.637	46363.9	49239.6	267.287	88.06	103.50	256	
410.000	0.66936	1.494	0.64517	26.029	47290.9	50278.8	269.853	89.74	104.38	262	
420.000	0.64574	1.549	0.61604	27.366	48230.4	51327.6	272.381	91.45	105.42	267	
430.000	0.62422	1.602	0.59010	28.656	49183.5	52387.5	274.875	93.17	106.58	272	
440.000	0.60446	1.654	0.56679	29.905	50150.7	53459.4	277.339	94.89	107.82	277	
450.000	0.58624	1.706	0.54569	31.119	51132.6	54544.2	279.777	96.61	109.14	282	
460.000	0.56933	1.756	0.52647	32.303	52129.6	55642.4	282.190	98.33	110.51	286	
470.000	0.55359	1.806	0.50886	33.460	53141.7	56754.5	284.582	100.04	111.91	291	
480.000	0.53888	1.856	0.49265	34.593	54169.4	57880.8	286.953	101.75	113.34	295	
490.000	0.52507	1.904	0.47765	35.705	55212.5	59021.5	289.305	103.44	114.79	299	
500.000	0.51209	1.953	0.46372	36.798	56271.2	60176.7	291.639	105.12	116.26	303	
520.000	0.48827	2.048	0.43860	38.935	58435.2	62531.3	296.256	108.42	119.20	311	
540.000	0.46688	2.142	0.41652	41.015	60661.0	64944.7	300.810	111.66	122.14	318	
560.000	0.44753	2.234	0.39689	43.047	62947.8	67416.8	305.305	114.83	125.06	326	
580.000	0.42931	2.326	0.37931	45.041	65294.7	69946.9	309.743	117.92	127.94	332	
600.000	0.41377	2.417	0.36343	47.000	67700.6	72534.2	314.129	120.93	130.78	339	

DEC-K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M75C
85.693	16.630	.06013	35.5074	1579.544	5510.6	5654.9	82.650	59.27	84.00
90.000	16.533	.06048	33.8660	1505.278	5872.0	6017.2	86.775	59.13	84.22
100.000	16.308	.06132	30.4679	1351.524	6714.8	6862.0	95.674	58.92	84.74
110.000	16.083	.06218	27.5450	1219.109	7562.9	7712.1	103.775	58.83	85.30
120.000	15.856	.06307	25.0028	1103.609	8416.8	8568.1	111.222	58.87	85.90
130.000	15.629	.06398	22.7715	1001.777	9276.8	9430.4	118.123	59.01	86.56
140.000	15.402	.06493	20.7981	911.160	10143.7	10299.5	124.563	59.26	87.28
150.000	15.173	.06591	19.0409	829.842	11018.0	11176.2	130.611	59.61	88.07
160.000	14.943	.06692	17.4674	756.360	11900.6	12061.2	136.323	60.04	88.95
170.000	14.711	.06798	16.0508	689.512	12792.3	12955.5	141.744	60.57	89.92
180.000	14.477	.06908	14.7694	628.332	13694.2	13860.0	146.913	61.18	90.99
190.000	14.240	.07022	13.6049	572.027	14607.2	14775.8	151.864	61.87	92.19
200.000	14.001	.07142	12.5419	519.941	15532.7	15704.1	156.626	62.64	93.51
210.000	13.758	.07269	11.5672	471.532	16472.0	16646.4	161.223	63.50	94.98
220.000	13.510	.07402	10.6695	426.347	17426.5	17604.2	165.678	64.43	96.61
230.000	13.257	.07543	9.8387	384.009	18398.1	18579.2	170.011	65.43	98.42
240.000	12.997	.07694	9.0661	344.198	19397.1	19581.8	174.290	66.52	100.44
250.000	12.730	.07856	8.3438	306.662	20420.7	20609.3	178.497	67.68	102.70
260.000	12.452	.08031	7.6645	271.180	21468.5	21661.3	182.636	68.92	105.24
270.000	12.164	.08221	7.0216	237.567	22541.7	22739.1	186.714	70.23	108.10
280.000	11.860	.08431	6.4086	205.670	23642.4	23844.8	190.744	71.61	111.36
290.000	11.539	.08666	5.8193	175.352	24773.9	24981.9	194.742	73.07	115.14
300.000	11.195	.08933	5.2471	146.492	25941.4	26155.6	198.728	74.61	119.60
310.000	10.820	.09242	4.6846	118.972	27153.0	27374.8	202.730	76.21	125.06
320.000	10.402	.09614	4.1223	92.655	28422.0	28652.7	206.790	77.88	132.12
330.000	9.920	.10081	3.5465	67.357	29771.5	30013.4	210.981	79.61	142.23
339.245	9.375	.10666	2.9784	44.553	31132.2	31388.2	215.092	81.30	158.14
339.245	1.312	.76247	.1633	9.388	40226.3	42056.2	246.538	83.98	140.02
340.000	1.299	.77000	.1605	9.679	40312.9	42160.9	246.846	83.73	137.38
350.000	1.168	.85594	.1350	12.849	41371.9	43426.1	250.515	82.76	119.14
360.000	1.078	.92745	.1195	15.348	42352.1	44578.0	253.761	83.32	112.15
370.000	1.009	.99119	.1085	17.499	43302.0	45680.9	256.783	84.38	108.82
380.000	.952	1.04987	.0999	19.424	44240.3	46760.0	259.661	85.68	107.22
390.000	.905	1.10496	.0930	21.189	45176.5	47828.4	262.436	87.14	106.59
400.000	.864	1.15734	.0873	22.832	46116.2	48893.8	265.133	88.68	106.57
410.000	.828	1.20758	.0825	24.379	47063.0	49961.2	267.769	90.28	106.96
420.000	.796	1.25611	.0783	25.850	48019.3	51033.9	270.354	91.92	107.63
430.000	.767	1.30323	.0746	27.256	48986.7	52114.4	272.897	93.59	108.50
440.000	.741	1.34915	.0713	28.608	49966.4	53204.3	275.402	95.27	109.51
450.000	.717	1.39405	.0684	29.914	50959.3	54305.0	277.876	96.95	110.64
460.000	.695	1.43809	.0658	31.180	51965.9	55417.4	280.320	98.64	111.85
470.000	.675	1.48136	.0634	32.412	52986.9	56542.1	282.739	100.33	113.12
480.000	.656	1.52397	.0612	33.613	54022.3	57679.8	285.135	102.01	114.44
490.000	.639	1.56599	.0592	34.787	55072.6	58831.0	287.508	103.68	115.79
500.000	.622	1.60748	.0574	35.937	56137.8	59995.7	289.861	105.33	117.17
520.000	.592	1.68911	.0541	38.175	58313.2	62367.0	294.511	108.61	119.97
540.000	.565	1.76922	.0512	40.342	60548.7	64794.8	299.092	111.83	122.81
560.000	.541	1.84806	.0487	42.451	62843.9	67279.3	303.609	114.97	125.64
580.000	.519	1.92585	.0464	44.511	65198.2	69820.2	308.067	118.05	128.45
600.000	.499	2.00276	.0444	46.531	67610.4	72417.0	312.469	121.04	131.23
620.000	.481	2.07890	.0425	48.514	70079.7	75069.0	316.817	123.96	133.96
640.000	.464	2.15439	.0409	50.468	72604.6	77775.1	321.112	126.81	136.64
660.000	.449	2.22931	.0394	52.394	75184.0	80534.3	325.357	129.57	139.27
680.000	.434	2.30373	.0380	54.298	77816.5	83345.5	329.553	132.26	141.84
700.000	.421	2.37772	.0367	56.181	80500.9	86207.4	333.701	134.88	144.34



## PROPANE ISOBAR AT P = 28 BAR

DEG K	T	DEN	L/MOL	VOL	DP/DT	OP/DO	E	H	S	CV	CP	M
		MOL/L			BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	%/SEC
85.730	16.632	16.536	.06013	.06013	35.5370	1582.863	5510.9	5679.3	82.654	59.27	84.00	2255
90.000	16.536	16.536	.06047	.06047	33.9092	1509.160	5869.1	6038.4	86.742	59.13	84.21	2257
100.000	16.311	16.311	.06131	.06131	30.5088	1355.210	6711.5	6883.1	95.640	58.92	84.73	2102
110.000	16.086	16.086	.06217	.06217	27.5841	1222.634	7559.1	7733.2	103.741	58.83	85.29	2004
120.000	15.860	15.860	.06305	.06305	25.0405	1107.005	8412.5	8589.0	111.186	58.87	85.89	1913
130.000	15.633	15.633	.06397	.06397	22.8079	1005.064	9272.0	9451.1	118.086	59.01	86.54	1828
140.000	15.406	15.406	.06491	.06491	20.8334	914.357	10138.3	10320.1	124.525	59.26	87.26	1747
150.000	15.178	15.178	.06589	.06589	19.0753	832.965	11012.1	11196.6	130.572	59.61	88.05	1670
160.000	14.948	14.948	.06690	.06690	17.5010	759.421	11894.1	12081.4	136.281	60.04	88.92	1597
170.000	14.717	14.717	.06795	.06795	16.0838	692.522	12785.1	12975.4	141.701	60.57	89.89	1526
180.000	14.483	14.483	.06905	.06905	14.8019	631.301	13686.2	13879.5	146.868	61.18	90.96	1458
190.000	14.247	14.247	.07019	.07019	13.6369	574.964	14598.4	14794.9	151.817	61.87	92.15	1393
200.000	14.009	14.009	.07138	.07138	12.5736	522.856	15523.0	15722.9	156.576	62.64	93.46	1330
210.000	13.766	13.766	.07264	.07264	11.5987	474.433	16461.2	16664.6	161.171	63.50	94.92	1268
220.000	13.519	13.519	.07397	.07397	10.7009	429.243	17414.6	17621.7	165.623	64.43	96.54	1207
230.000	13.267	13.267	.07537	.07537	9.8703	386.909	18384.9	18596.0	169.953	65.44	98.34	1148
240.000	13.009	13.009	.07687	.07687	9.0980	347.114	19382.4	19597.6	174.228	66.52	100.34	1089
250.000	12.743	12.743	.07848	.07848	8.3762	309.603	20404.2	20624.0	178.431	67.68	102.57	1031
260.000	12.467	12.467	.08021	.08021	7.6978	274.157	21449.9	21674.5	182.563	68.92	105.08	973
270.000	12.180	12.180	.08210	.08210	7.0561	240.596	22520.6	22750.5	186.634	70.23	107.89	915
280.000	11.880	11.880	.08418	.08418	6.4448	208.768	23618.1	23853.8	190.656	71.62	111.09	856
290.000	11.562	11.562	.08649	.08649	5.8578	178.541	24745.7	24987.9	194.643	73.08	114.78	797
300.000	11.222	11.222	.08911	.08911	5.2889	149.800	25908.0	26157.5	198.614	74.62	119.10	736
310.000	10.853	10.853	.09214	.09214	4.7310	122.440	27112.6	27370.6	202.597	76.22	124.33	673
320.000	10.444	10.444	.09575	.09575	4.1759	96.345	28371.3	28639.4	206.629	77.89	130.98	606
330.000	9.978	9.978	.10023	.10023	3.6115	71.374	29704.1	29984.8	210.772	79.61	140.19	533
340.000	9.413	9.413	.10623	.10623	3.0164	47.272	31150.8	31448.2	215.144	81.41	155.26	452
347.153	8.894	8.894	.11243	.11243	2.5429	30.205	32308.9	32623.8	218.567	82.80	176.75	382
347.153	1.614	1.614	.61958	.61958	.2118	7.368	40364.2	42099.1	245.862	87.61	168.71	179
350.000	1.542	1.542	.64863	.64863	.1957	8.657	40736.2	42552.4	247.162	86.29	151.42	185
360.000	1.370	1.370	.72985	.72985	.1624	12.104	41876.4	43919.9	251.016	85.21	126.98	202
370.000	1.257	1.257	.79558	.79558	.1427	14.786	42910.8	45138.5	254.356	85.69	117.93	214
380.000	1.172	1.172	.85336	.85336	.1288	17.074	43904.1	46293.5	257.436	86.69	113.57	225
390.000	1.104	1.104	.90611	.90611	.1182	19.110	44879.8	47416.9	260.355	87.94	111.37	234
400.000	1.047	1.047	.95532	.95532	.1098	20.969	45849.8	48524.7	263.159	89.35	110.33	242
410.000	.998	.998	1.00191	1.00191	.1028	22.693	46820.7	49626.0	265.879	90.86	110.02	249
420.000	.956	.956	1.04643	1.04643	.0969	24.312	47796.7	50726.7	268.531	92.42	110.18	256
430.000	.918	.918	1.08931	1.08931	.0918	25.846	48780.7	51830.7	271.129	94.02	110.67	262
440.000	.884	.884	1.13084	1.13084	.0874	27.310	49774.5	52940.9	273.681	95.66	111.39	268
450.000	.854	.854	1.17122	1.17122	.0835	28.714	50779.7	54059.1	276.194	97.30	112.28	274
460.000	.826	.826	1.21065	1.21065	.0800	30.068	51797.2	55187.0	278.673	98.96	113.30	279
470.000	.800	.800	1.24925	1.24925	.0768	31.378	52827.6	56325.5	281.122	100.61	114.42	284
480.000	.777	.777	1.28712	1.28712	.0740	32.650	53871.6	57475.6	283.543	102.27	115.60	289
490.000	.755	.755	1.32437	1.32437	.0714	33.889	54929.5	58637.8	285.939	103.92	116.85	293
500.000	.735	.735	1.36106	1.36106	.0690	35.098	56001.7	59812.6	288.313	105.56	118.13	298
520.000	.698	.698	1.43300	1.43300	.0648	37.440	58189.2	62201.6	292.997	108.80	120.78	307
540.000	.665	.665	1.50335	1.50335	.0612	39.697	60434.9	64644.2	297.606	111.99	123.50	315
560.000	.636	.636	1.57239	1.57239	.0580	41.884	62738.8	67141.5	302.147	115.12	126.24	322
580.000	.610	.610	1.64035	1.64035	.0552	44.012	65100.6	69693.6	306.624	118.17	128.97	330
600.000	.586	.586	1.70739	1.70739	.0527	46.091	67519.6	72300.3	311.043	121.16	131.69	337
620.000	.564	.564	1.77366	1.77366	.0504	48.128	69994.6	74960.9	315.404	124.06	134.37	343

85.767	16.634	.06012	35.5665	1586.182	5511.3	5703.7	82.658	59.27	83.99	2257
90.000	.06046	.06046	33.9523	1513.044	5866.2	6059.7	86.709	59.13	84.20	2210
100.000	16.314	.06130	30.5498	1358.896	6708.1	6904.3	95.606	58.92	84.72	2105
110.000	16.089	.06215	27.6233	1226.161	7555.3	7754.2	103.706	58.83	85.28	2007
120.000	15.864	.06304	25.0781	1110.400	8408.2	8609.9	111.150	58.87	85.88	1916
130.000	15.637	.06395	22.8443	1008.351	9267.2	9471.9	118.049	59.01	86.53	1831
140.000	15.410	.06489	20.8687	917.554	10133.0	10340.7	124.487	59.26	87.24	1750
150.000	15.182	.06587	19.1097	836.087	11006.2	11217.0	130.532	59.61	88.03	1673
160.000	14.953	.06688	17.5346	762.481	11887.5	12101.6	136.240	60.05	88.90	1600
170.000	14.722	.06792	16.1168	695.530	12777.9	12995.3	141.658	60.57	89.86	1529
180.000	14.490	.06902	14.8342	634.268	13678.3	13899.1	146.824	61.18	90.93	1462
190.000	14.254	.07015	13.6689	577.899	14589.7	14814.2	151.771	61.87	92.11	1396
200.000	14.016	.07135	12.6052	525.768	15513.3	15741.6	156.528	62.65	93.41	1333
210.000	13.775	.07260	11.6301	477.331	16450.5	16682.9	161.119	63.50	94.86	1271
220.000	13.529	.07392	10.7323	432.136	17402.8	17639.4	165.569	64.43	96.47	1211
230.000	13.278	.07531	9.9018	389.806	18371.8	18612.8	169.896	65.44	98.25	1152
240.000	13.020	.07680	9.1298	350.023	19367.8	19613.5	174.166	66.52	100.24	1093
250.000	12.756	.07840	8.4085	312.536	20387.9	20638.7	178.364	67.69	102.45	1035
260.000	12.482	.08012	7.7309	277.126	21431.5	21687.9	182.491	68.93	104.92	978
270.000	12.197	.08199	7.0903	243.614	22499.7	22762.0	186.556	70.24	107.69	920
280.000	11.899	.08404	6.4806	211.851	23594.2	23863.1	190.569	71.53	110.84	862
290.000	11.584	.08633	5.8959	181.709	24717.9	24994.2	194.546	73.09	114.43	803
300.000	11.248	.08890	5.3300	153.081	25875.3	26159.8	198.503	74.62	118.63	742
310.000	10.885	.09187	4.7766	125.869	27073.2	27367.2	202.467	76.23	123.65	680
320.000	10.485	.09537	4.2279	99.976	28322.3	28627.5	206.472	77.89	129.94	614
330.000	10.032	.09968	3.6737	75.294	29640.3	29959.2	210.573	79.62	138.39	544
340.000	9.494	.10533	3.0971	51.654	31059.4	31396.5	214.867	81.39	151.43	466
350.000	8.788	.11379	2.4577	28.637	32659.5	33023.7	219.586	83.28	178.87	373
354.253	8.371	.11946	2.1352	18.686	33456.1	33838.4	221.901	84.29	207.65	323
354.253	1.978	.50563	.2739	5.290	40380.4	41998.4	244.935	91.65	220.06	169
360.000	1.766	.56632	.2273	8.222	41239.4	43051.6	247.886	88.23	160.78	184
370.000	1.559	.64151	.1880	11.771	42440.7	44493.5	251.838	87.37	133.08	201
380.000	1.425	.70171	.1646	14.551	43520.4	45765.8	255.232	87.87	122.73	214
390.000	1.326	.75427	.1483	16.925	44551.7	46965.1	258.348	88.85	117.68	225
400.000	1.247	.80203	.1359	19.038	45560.7	48127.2	261.290	90.09	115.04	234
410.000	1.181	.84645	.1260	20.963	46561.5	49270.1	264.112	91.47	113.70	243
420.000	1.126	.88836	.1178	22.748	47561.2	50403.9	266.844	92.95	113.17	250
430.000	1.077	.92834	.1109	24.422	48564.5	51535.2	269.506	94.48	113.16	257
440.000	1.034	.96676	.1050	26.006	49574.6	52668.2	272.111	96.06	113.50	263
450.000	.996	1.00391	.0999	27.515	50593.6	53806.1	274.668	97.66	114.10	270
460.000	.962	1.03999	.0953	28.961	51622.9	54950.9	277.185	99.28	114.89	275
470.000	.930	1.07517	.0913	30.354	52663.8	56104.4	279.665	100.91	115.82	281
480.000	.901	1.10956	.0877	31.701	53717.1	57267.7	282.114	102.53	116.86	286
490.000	.875	1.14328	.0844	33.007	54783.3	58441.8	284.535	104.16	117.97	291
500.000	.850	1.17641	.0814	34.278	55862.8	59627.3	286.930	105.78	119.15	295
520.000	.806	1.24115	.0761	36.727	58063.1	62034.8	291.651	108.99	121.63	304
540.000	.767	1.30421	.0716	39.076	60319.5	64493.0	296.290	112.16	124.21	313
560.000	.732	1.36592	.0677	41.342	62632.6	67003.6	300.854	115.26	126.85	321
580.000	.701	1.42652	.0643	43.539	65002.2	69567.1	305.352	118.30	129.51	328
600.000	.673	1.48617	.0613	45.679	67428.0	72183.7	309.787	121.27	132.16	335
620.000	.647	1.54504	.0585	47.770	69909.1	74853.2	314.163	124.17	134.78	342
640.000	.624	1.60322	.0561	49.819	72444.5	77574.9	318.484	126.99	137.38	349
660.000	.602	1.66083	.0539	51.832	75033.4	80348.0	322.750	129.74	139.93	356
680.000	.582	1.71792	.0518	53.813	77674.4	83171.7	326.965	132.41	142.43	362
700.000	.564	1.77457	.0500	55.767	80366.4	86045.0	331.129	135.01	144.89	368



Table 30. Continued.

PROPANE ISOBAR AT P = 36 BAR

DEG K	T	DEN	VOL	DP/DI	DP/DD	E	H	S	CV	CP	M/SEC
		MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	
85.804		16.635	.06011	35.5960	1589.500	5511.6	5728.0	82.662	59.27	83.99	2260
90.000		16.541	.06045	33.9953	1516.928	5863.3	6080.9	86.676	59.14	84.19	2213
100.000		16.317	.06129	30.5906	1362.582	6704.8	6925.4	95.572	58.92	84.71	2107
110.000		16.092	.06214	27.6624	1229.687	7551.5	7775.2	103.671	58.83	85.26	2010
120.000		15.867	.06302	25.1157	1113.795	8403.9	8630.8	111.115	58.87	85.86	1919
130.000		15.641	.06393	22.8807	1011.638	9262.5	9492.6	118.012	59.01	86.51	1833
140.000		15.415	.06487	20.9040	920.750	10127.7	10361.3	124.448	59.26	87.22	1753
150.000		15.187	.06585	19.1440	839.209	11000.3	11237.4	130.492	59.61	88.01	1676
160.000		14.958	.06685	17.5682	765.539	11881.1	12121.7	136.199	60.05	88.88	1602
170.000		14.728	.06790	16.1496	698.537	12770.7	13015.2	141.615	60.57	89.83	1532
180.000		14.496	.06899	14.8666	637.233	13670.4	13918.7	146.779	61.18	90.89	1465
190.000		14.261	.07012	13.7007	580.832	14580.9	14833.4	151.724	61.87	92.07	1399
200.000		14.024	.07131	12.6368	528.678	15503.7	15760.4	156.479	62.65	93.36	1336
210.000		13.783	.07255	11.6615	480.226	16439.9	16701.1	161.068	63.50	94.80	1275
220.000		13.538	.07387	10.7636	435.025	17391.1	17657.0	165.515	64.43	96.40	1214
230.000		13.288	.07526	9.9332	392.697	18358.8	18629.7	169.838	65.44	98.17	1155
240.000		13.032	.07674	9.1614	352.927	19353.3	19629.5	174.105	66.53	100.14	1097
250.000		12.768	.07832	8.4407	315.462	20371.7	20653.6	178.298	67.69	102.32	1039
260.000		12.496	.08003	7.7638	280.086	21413.3	21701.4	182.420	68.93	104.76	982
270.000		12.213	.08188	7.1243	246.620	22479.0	22773.8	186.478	70.25	107.50	925
280.000		11.917	.08391	6.5162	214.919	23570.6	23872.7	190.483	71.63	110.58	867
290.000		11.606	.08617	5.9335	184.859	24690.6	25000.8	194.450	73.10	114.10	808
300.000		11.274	.08870	5.3706	156.336	25843.3	26162.6	198.394	74.63	118.18	749
310.000		10.916	.09161	4.8212	129.262	27034.8	27364.6	202.346	76.24	123.02	687
320.000		10.524	.09502	4.2785	103.553	28275.1	28617.1	206.321	77.90	128.97	623
330.000		10.084	.09917	3.7335	79.129	29579.4	29936.4	210.384	79.62	136.79	555
340.000		9.569	.10451	3.1726	55.878	30974.9	31351.1	214.610	81.37	148.26	480
350.000		8.917	.11215	2.5677	33.577	32520.7	32924.4	219.173	83.17	169.61	394
360.000		7.873	.12702	1.8084	11.254	34452.3	34909.6	224.764	85.89	254.68	275
360.693		7.755	.12896	1.7363	9.579	34628.9	35093.2	225.274	86.35	275.13	263
360.693		2.451	.40797	.3597	3.194	40223.4	41692.1	243.569	96.80	339.97	159
370.000		1.959	.51046	.2536	8.331	41829.8	43667.4	248.984	89.80	164.21	185
380.000		1.729	.57835	.2109	11.826	43067.1	45149.2	252.937	89.31	137.11	202
390.000		1.580	.63306	.1849	14.626	44181.1	46460.2	256.343	89.89	126.42	215
400.000		1.469	.68085	.1665	17.037	45243.8	47694.8	259.470	90.89	121.08	226
410.000		1.381	.72425	.1525	19.191	46282.5	48889.8	262.420	92.13	118.20	236
420.000		1.308	.76456	.1414	21.158	47310.9	50063.3	265.249	93.50	116.69	244
430.000		1.246	.80257	.1322	22.984	48337.1	51226.3	267.985	94.96	116.01	252
440.000		1.192	.83879	.1244	24.696	49365.8	52385.4	270.650	96.48	115.88	259
450.000		1.145	.87356	.1177	26.316	50400.3	53545.1	273.256	98.03	116.12	265
460.000		1.102	.90715	.1119	27.860	51442.9	54708.7	275.814	99.61	116.63	271
470.000		1.064	.93974	.1068	29.340	52495.3	55878.4	278.329	101.20	117.34	277
480.000		1.029	.97149	.1023	30.763	53558.6	57056.0	280.808	102.80	118.20	283
490.000		.997	1.00252	.0982	32.139	54633.7	58242.7	283.255	104.40	119.17	288
500.000		.968	1.03291	.0945	33.473	55721.1	59439.6	285.673	106.00	120.22	293
520.000		.916	1.09210	.0880	36.033	57935.0	61866.6	290.432	109.18	122.51	302
540.000		.870	1.14954	.0825	38.475	60202.6	64341.0	295.101	112.32	124.95	311
560.000		.829	1.20558	.0778	40.822	62525.2	66865.3	299.691	115.41	127.48	319
580.000		.793	1.26046	.0737	43.089	64902.9	69440.6	304.210	118.43	130.05	327
600.000		.761	1.31438	.0701	45.290	67335.7	72067.5	308.662	121.38	132.64	335
620.000		.731	1.36749	.0669	47.436	69823.0	74723.0	313.188	124.38	135.38	343

85.841	16.637	.06011	35.6254	1592.819	5512.0	5752.4	82.666	59.27	83.98	2262
90.000	16.544	.06044	34.0384	1520.814	5860.3	6102.1	86.643	59.14	84.19	2215
100.000	16.320	.06127	30.6315	1366.269	6701.4	6946.5	95.539	58.92	84.70	2110
110.000	16.096	.06213	27.7014	1233.214	7547.8	7796.3	103.636	58.83	85.25	2013
120.000	15.871	.06301	25.1533	1117.191	8399.7	8651.7	111.079	58.87	85.85	1922
130.000	15.645	.06392	22.9169	1014.925	9257.7	9513.4	117.975	59.01	86.50	1836
140.000	15.419	.06485	20.9392	923.946	10122.4	10381.9	124.410	59.26	87.21	1755
150.000	15.192	.06582	19.1783	842.329	10994.5	11257.8	130.453	59.61	87.99	1679
160.000	14.964	.06683	17.6017	768.597	11874.6	12141.9	136.158	60.05	88.85	1605
170.000	14.734	.06787	16.1825	701.543	12763.6	13035.1	141.573	60.57	89.80	1535
180.000	14.502	.06896	14.8988	640.197	13662.5	13938.3	146.735	61.18	90.86	1468
190.000	14.268	.07009	13.7326	583.763	14572.3	14852.6	151.678	61.88	92.03	1403
200.000	14.031	.07127	12.6682	531.585	15494.1	15779.2	156.430	62.65	93.32	1339
210.000	13.791	.07251	11.6928	483.118	16429.4	16719.4	161.017	63.50	94.75	1278
220.000	13.547	.07382	10.7948	437.910	17379.4	17674.7	165.461	64.44	96.33	1218
230.000	13.298	.07520	9.9644	395.584	18345.8	18646.6	169.781	65.44	98.09	1159
240.000	13.043	.07667	9.1930	355.826	19338.9	19645.6	174.044	66.53	100.04	1101
250.000	12.781	.07824	8.4727	318.382	20355.6	20668.6	178.233	67.70	102.20	1044
260.000	12.510	.07993	7.7965	283.037	21395.2	21715.0	182.349	68.94	104.61	986
270.000	12.229	.08177	7.1581	249.616	22458.6	22755.7	186.401	70.25	107.31	929
280.000	11.936	.08378	6.5514	217.973	23547.3	23882.4	190.399	71.64	110.34	872
290.000	11.627	.08601	5.9708	187.990	24663.8	25007.8	194.355	73.11	113.79	814
300.000	11.299	.08850	5.4106	159.566	25811.9	26165.9	198.287	74.64	117.75	755
310.000	10.947	.09135	4.8651	132.620	26997.4	27362.8	202.217	76.25	122.42	694
320.000	10.562	.09468	4.3279	107.081	28229.3	28608.0	206.174	77.91	128.08	631
330.000	10.133	.09868	3.7911	82.887	29521.3	29916.0	210.202	79.63	135.35	565
340.000	9.638	.10376	3.2438	59.969	30896.0	31311.1	214.370	81.36	145.59	493
350.000	9.028	.11076	2.6655	38.219	32399.1	32842.1	218.811	83.10	162.93	412
360.000	8.155	.12262	1.9981	17.299	34167.7	34658.2	223.928	85.24	210.17	311
366.552	6.880	.14535	1.3051	2.761	35985.4	36566.8	229.176	96.04	573.86	193
366.552	3.194	.31305	.5013	1.147	39710.5	40962.7	241.169	106.09	892.94	147
370.000	2.615	.38239	.3720	4.164	40866.2	42395.8	245.063	94.45	274.26	165
380.000	2.117	.47228	.2743	8.878	42502.1	44391.2	250.391	91.18	163.03	189
390.000	1.878	.53241	.2307	12.221	43753.4	45883.1	254.267	91.09	139.25	205
400.000	1.719	.58176	.2031	14.979	44891.6	47218.7	257.649	91.78	129.07	218
410.000	1.600	.62515	.1833	17.386	45979.8	48480.4	260.765	92.83	123.80	229
420.000	1.505	.66465	.1681	19.551	47043.7	49702.4	263.710	94.08	120.89	238
430.000	1.426	.70139	.1559	21.537	48097.0	50902.5	266.534	95.45	119.31	247
440.000	1.359	.73604	.1458	23.385	49147.2	52091.4	269.267	96.90	118.56	254
450.000	1.300	.76905	.1372	25.121	50199.4	53275.6	271.929	98.41	118.36	261
460.000	1.249	.80075	.1299	26.766	51256.8	54459.8	274.952	99.94	118.54	268
470.000	1.203	.83136	.1235	28.335	52321.8	55647.2	277.085	101.50	118.99	274
480.000	1.161	.86105	.1179	29.838	53396.0	56840.2	279.597	103.07	119.64	280
490.000	1.124	.88997	.1128	31.285	54480.7	58040.5	282.072	104.65	120.44	285
500.000	1.089	.91821	.1083	32.683	55576.6	59249.4	284.514	106.23	121.36	290
520.000	1.028	.97302	.1005	35.357	57804.8	61696.9	289.313	109.37	123.43	300
540.000	.975	1.02599	.0939	37.894	60084.2	64488.2	294.014	112.49	125.72	309
560.000	.928	1.07750	.0884	40.322	62416.6	66726.6	298.630	115.55	128.14	318
580.000	.887	1.12783	.0835	42.660	64802.8	69314.1	303.169	118.55	130.62	326
600.000	.849	1.17717	.0793	44.923	67242.8	71951.4	307.640	121.49	133.12	334
620.000	.816	1.22568	.0755	47.124	69736.3	74639.0	312.046	124.37	135.64	341
640.000	.785	1.27350	.0721	49.270	72282.8	77376.8	316.392	127.17	138.13	348
660.000	.757	1.32071	.0691	51.370	74881.4	80164.2	320.680	129.90	140.61	355
680.000	.731	1.36740	.0664	53.430	77531.2	83000.8	324.914	132.56	143.04	361
700.000	.707	1.41364	.0639	55.454	80231.1	85885.7	329.095	135.15	145.44	367



Table 30. Continued.

PROPANE ISOBAR AT P = 41 BAR

T	DEN	VOL	DP/DT	DP/DD	E	H	S	CV	CP
DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	M/SEC
85.850	16.637	.06011	35.6328	1593.648	5512.1	5758.5	82.667	59.27	83.98
90.000	16.545	.06044	34.0491	1521.785	5859.6	6107.4	86.635	59.14	84.18
100.000	16.321	.06127	30.6417	1367.191	6700.6	6951.8	95.530	58.92	84.70
110.000	16.096	.06213	27.7112	1234.095	7546.8	7801.5	103.628	58.83	85.25
120.000	15.872	.06301	25.1626	1118.039	8398.6	8657.0	111.070	58.87	85.84
130.000	15.646	.06391	22.9260	1015.746	9256.6	9518.6	117.966	59.01	86.49
140.000	15.420	.06485	20.9480	924.745	10121.1	10387.0	124.401	59.26	87.20
150.000	15.193	.06582	19.1869	843.109	10993.0	11262.9	130.443	59.61	87.98
160.000	14.965	.06682	17.6100	769.361	11873.0	12147.0	136.148	60.05	88.85
170.000	14.735	.06786	16.1907	702.294	12761.8	13040.1	141.562	60.57	89.80
180.000	14.504	.06895	14.9069	640.937	13660.5	13943.2	146.724	61.18	90.85
190.000	14.270	.07008	13.7405	584.495	14570.1	14857.4	151.666	61.88	92.02
200.000	14.033	.07126	12.6761	532.311	15491.8	15783.9	156.418	62.65	93.31
210.000	13.793	.07250	11.7006	483.841	16426.8	16724.0	161.004	63.50	94.73
220.000	13.549	.07380	10.8026	438.630	17376.5	17679.1	165.447	64.44	96.32
230.000	13.301	.07518	9.9722	396.305	18342.6	18650.9	169.767	65.45	98.07
240.000	13.046	.07665	9.2008	356.549	19335.3	19649.6	174.029	66.53	100.01
250.000	12.784	.07822	8.4806	319.110	20351.6	20672.3	178.217	67.70	102.17
260.000	12.514	.07991	7.8046	283.773	21390.8	21718.4	182.331	68.94	104.58
270.000	12.233	.08174	7.1665	250.363	22453.6	22788.7	186.382	70.25	107.26
280.000	11.940	.08375	6.5601	218.735	23541.5	23884.9	190.378	71.64	110.28
290.000	11.632	.08597	5.9800	188.769	24657.1	25009.6	194.332	73.11	113.71
300.000	11.305	.08845	5.4205	160.369	25804.1	26166.8	198.261	74.64	117.65
310.000	10.954	.09129	4.8759	133.454	26988.2	27362.5	202.186	76.25	122.27
320.000	10.572	.09459	4.3400	107.955	28218.1	28605.9	206.138	77.91	127.87
330.000	10.145	.09857	3.8052	83.815	29507.1	29911.2	210.158	79.63	135.02
340.000	9.654	.10358	3.2610	60.974	30877.1	31301.8	214.312	81.36	144.98
350.000	9.054	.11045	2.6885	39.341	32370.8	32823.6	218.726	83.09	161.53
360.000	8.211	.12179	2.0369	18.667	34110.7	34610.0	223.760	85.15	203.84
367.927	6.536	.15300	1.1740	1.451	36432.8	37060.1	230.478	110.70	928.84
367.927	3.502	.28555	.5606	.655	39435.6	40606.4	240.117	111.21	1551.17
370.000	2.901	.34473	.4265	2.888	40464.0	41877.4	243.564	96.89	373.86
380.000	2.235	.44739	.2944	8.106	42334.1	44168.4	249.683	91.75	173.07
390.000	1.962	.50963	.2441	11.606	43634.9	45724.4	253.727	91.42	143.43
400.000	1.787	.55964	.2134	14.458	44797.0	47091.5	257.189	92.02	131.48
410.000	1.658	.60317	.1918	16.932	45899.8	48372.8	260.353	93.02	125.41
420.000	1.556	.64258	.1753	19.148	46974.0	49608.6	263.331	94.23	122.07
430.000	1.473	.67908	.1622	21.176	48034.8	50819.1	266.180	95.58	120.22
440.000	1.402	.71342	.1515	23.058	49091.0	52016.0	268.931	97.01	119.29
450.000	1.340	.74608	.1424	24.824	50147.9	53206.8	271.608	98.50	118.96
460.000	1.286	.77737	.1346	26.494	51209.3	54396.6	274.222	100.03	119.04
470.000	1.238	.80756	.1279	28.085	52277.7	55588.6	276.786	101.58	119.42
480.000	1.195	.83681	.1219	29.609	53354.7	56785.7	279.306	103.14	120.02
490.000	1.156	.86527	.1166	31.074	54441.8	57989.5	281.788	104.71	120.77
500.000	1.120	.89305	.1119	32.489	55540.0	59201.5	284.237	106.29	121.65
520.000	1.056	.94689	.1037	35.190	57772.0	61654.2	289.047	109.42	123.67
540.000	1.001	.99889	.0969	37.751	60054.4	64149.8	293.756	112.53	125.92
560.000	.953	1.04942	.0910	40.200	62389.3	66691.9	298.378	115.58	128.30
580.000	.910	1.09874	.0860	42.556	64777.6	69282.4	302.923	118.58	130.76
600.000	.872	1.14708	.0816	44.835	67219.4	71922.4	307.398	121.52	133.25
620.000	.837	1.19459	.0777	47.049	69714.6	74612.4	311.808	124.39	135.75

DEG K	MOL/L	L/MOL	BAR/L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
85.859	16.638	.06010	35.6401	1594.478	5512.2	5764.6	82.668	59.27	83.98
90.000	16.545	.06044	34.0598	1522.757	5858.9	6112.7	86.627	59.14	84.18
100.000	16.321	.06127	30.6519	1368.112	6699.8	6957.1	95.522	58.92	84.70
110.000	16.097	.06212	27.7209	1234.977	7545.9	7806.8	103.619	58.83	85.25
120.000	15.872	.06300	25.1720	1118.888	8397.6	8662.2	111.051	58.87	85.84
130.000	15.647	.06391	22.9351	1016.568	9255.4	9523.8	117.956	59.01	86.49
140.000	15.421	.06485	20.9568	925.543	10119.8	10392.2	124.391	59.26	87.20
150.000	15.194	.06581	19.11955	843.889	10991.6	11268.0	130.433	59.61	87.98
160.000	14.966	.06682	17.6184	770.125	11871.4	12152.0	136.138	60.05	88.84
170.000	14.737	.06786	16.11989	703.045	12760.0	13045.1	141.551	60.57	89.79
180.000	14.505	.06894	14.9149	641.678	13658.6	13948.1	146.713	61.18	90.84
190.000	14.272	.07007	13.7484	585.228	14568.0	14862.2	151.655	61.88	92.01
200.000	14.035	.07125	12.6840	533.038	15489.4	15788.6	156.406	62.65	93.29
210.000	13.795	.07249	11.7084	484.563	16424.1	16728.6	160.992	63.50	94.72
220.000	13.552	.07379	10.8104	439.351	17373.6	17683.5	165.434	64.44	96.30
230.000	13.303	.07517	9.9800	397.026	18339.4	18655.1	169.752	65.45	98.05
240.000	13.049	.07664	9.2087	357.273	19331.7	19653.6	174.014	66.53	99.99
250.000	12.787	.07820	8.4886	319.839	20347.6	20676.1	178.200	67.70	102.14
260.000	12.517	.07989	7.8128	284.509	21386.3	21721.8	182.314	68.94	104.54
270.000	12.237	.08172	7.1748	251.109	22448.5	22791.7	186.363	70.25	107.22
280.000	11.945	.08372	6.5689	219.495	23535.8	23887.4	190.357	71.64	110.22
290.000	11.638	.08593	5.9892	189.548	24650.5	25011.4	194.308	73.11	113.63
300.000	11.312	.08840	5.4304	161.172	25796.4	26167.7	198.234	74.65	117.54
310.000	10.962	.09123	4.8867	134.287	26979.1	27362.2	202.156	76.25	122.13
320.000	10.581	.09451	4.3521	108.827	28207.0	28603.9	206.102	77.92	127.66
330.000	10.157	.09845	3.8192	84.739	29493.1	29906.6	210.114	79.63	134.69
340.000	9.671	.10341	3.2780	61.971	30858.5	31292.8	214.255	81.36	144.40
350.000	9.079	.11014	2.7109	40.451	32343.2	32805.8	218.644	83.07	160.21
360.000	8.263	.12103	2.0735	19.997	34057.4	34565.8	223.603	85.07	198.45
369.258	5.975	.16738	1.0003	.354	37077.2	37780.2	232.388	220.20	3140.07
369.258	4.013	.24920	.6573	.179	38928.0	39974.6	238.330	124.45	5656.09
370.000	3.386	.29532	.5212	1.356	39807.7	41048.0	241.235	102.06	748.33
380.000	2.365	.42284	.3168	7.320	42151.1	43927.1	248.934	92.38	185.55
390.000	2.051	.48763	.2584	10.988	43510.7	45558.7	253.174	91.77	148.13
400.000	1.857	.53842	.2242	13.936	44699.4	46960.7	256.725	92.26	134.09
410.000	1.718	.58215	.2005	16.477	45818.1	48263.1	259.941	93.21	127.12
420.000	1.609	.62150	.1828	18.745	46903.0	49513.3	262.954	94.38	123.30
430.000	1.520	.65781	.1687	20.815	47971.8	50734.5	265.828	95.71	121.16
440.000	1.445	.69186	.1573	22.731	49034.1	51939.9	268.599	97.12	120.04
450.000	1.381	.72418	.1477	24.527	50095.9	53137.5	271.290	98.60	119.57
460.000	1.324	.75510	.1394	26.223	51161.4	54332.8	273.917	100.11	119.56
470.000	1.274	.78489	.1323	27.837	52233.1	55529.7	276.491	101.65	119.86
480.000	1.229	.81372	.1261	29.380	53313.2	56730.8	279.020	103.21	120.40
490.000	1.188	.84175	.1205	30.864	54402.9	57938.2	281.510	104.77	121.11
500.000	1.151	.86909	.1155	32.295	55503.2	59153.4	283.965	106.34	121.95
520.000	1.085	.92203	.1070	35.025	57739.0	61611.5	288.785	109.47	123.91
540.000	1.028	.97310	.0998	37.610	60024.5	64111.5	293.502	112.57	126.12
560.000	.978	1.02268	.0938	40.079	62361.9	66657.2	298.131	115.62	128.47
580.000	.934	1.07106	.0885	42.453	64752.3	69250.8	302.681	118.62	130.90
600.000	.894	1.11844	.0840	44.748	67196.0	71893.5	307.161	121.55	133.37
620.000	.858	1.16498	.0799	46.975	69692.8	74585.7	311.574	124.42	135.85
640.000	.826	1.21082	.0763	49.146	72242.1	77327.6	315.927	127.21	138.33
660.000	.796	1.25606	.0731	51.268	74843.2	80118.7	320.221	129.94	140.78
680.000	.769	1.30077	.0701	53.348	77495.2	82958.5	324.460	132.60	143.20
700.000	.743	1.34502	.0674	55.390	80197.2	85846.3	328.645	135.18	145.58



Table 30. Continued.

PROPANE ISOBAR AT P = 43 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DO BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
85.869	16.638	.06010	35.6475	1595.307	5512.3	5770.7	82.669	59.27	83.98	2264
90.000	16.546	.06044	34.0706	1523.728	5858.2	6118.1	86.619	59.14	84.18	2217
100.000	16.322	.06127	30.6621	1369.034	6699.0	6962.4	95.513	58.92	84.69	2112
110.000	16.098	.06212	27.7307	1235.859	7544.9	7812.1	103.610	58.83	85.24	2015
120.000	15.873	.06300	25.1814	1119.737	8396.5	8667.4	111.052	58.87	85.84	1924
130.000	15.648	.06391	22.9441	1017.389	9254.2	9529.0	117.947	59.01	86.49	1838
140.000	15.422	.06484	20.9656	926.342	10118.5	10397.3	124.382	59.26	87.19	1758
150.000	15.195	.06581	19.2040	844.669	10990.1	11273.1	130.423	59.61	87.97	1681
160.000	14.967	.06681	17.6268	770.889	11869.8	12157.0	136.128	60.05	88.83	1608
170.000	14.738	.06785	16.2070	703.796	12758.3	13050.0	141.541	60.57	89.78	1538
180.000	14.507	.06893	14.9230	642.419	13656.6	13953.0	146.702	61.18	90.83	1470
190.000	14.273	.07006	13.7564	585.960	14565.8	14867.1	151.643	61.88	92.00	1405
200.000	14.037	.07124	12.6918	533.764	15487.0	15793.3	156.394	62.65	93.28	1342
210.000	13.798	.07248	11.7162	485.285	16421.5	16733.2	160.979	63.50	94.71	1281
220.000	13.554	.07378	10.8181	440.071	17370.7	17688.0	165.421	64.44	96.28	1221
230.000	13.306	.07516	9.9878	397.746	18336.2	18659.4	169.738	65.45	98.03	1162
240.000	13.051	.07662	9.2165	357.996	19328.2	19657.7	173.999	66.53	99.97	1104
250.000	12.790	.07818	8.4965	320.567	20343.7	20679.8	178.184	67.70	102.11	1047
260.000	12.521	.07987	7.8209	285.245	21381.8	21725.3	182.296	68.94	104.50	990
270.000	12.241	.08169	7.1832	251.855	22443.5	22794.8	186.344	70.26	107.17	933
280.000	11.950	.08369	6.5776	220.255	23530.1	23889.9	190.336	71.65	110.16	876
290.000	11.643	.08589	5.9984	190.326	24643.9	25013.3	194.285	73.11	113.55	818
300.000	11.318	.08836	5.4403	161.973	25788.7	26168.7	198.208	74.65	117.44	760
310.000	10.969	.09116	4.8975	135.117	26970.0	27362.0	202.126	76.25	121.99	700
320.000	10.590	.09443	4.3641	109.697	28195.9	28602.0	206.066	77.92	127.46	637
330.000	10.169	.09834	3.8331	85.660	29479.2	29902.1	210.070	79.63	134.37	572
340.000	9.687	.10324	3.2947	62.962	30840.1	31284.0	214.199	81.36	143.83	502
350.000	9.103	.10985	2.7329	41.548	32316.4	32788.7	218.564	83.06	158.98	424
360.000	8.311	.12032	2.1082	21.292	34007.3	34524.7	223.456	85.01	193.80	331
370.000	6.262	.15969	1.1049	1.225	36872.6	37559.3	231.730	94.02	1034.63	174
380.000	2.510	.39847	.3422	6.522	41949.8	43663.3	248.131	93.07	201.43	178
390.000	2.144	.46632	.2738	10.367	43380.3	45385.5	252.608	92.14	153.45	197
400.000	1.930	.51802	.2356	13.414	44598.6	46826.1	256.256	92.51	136.92	212
410.000	1.779	.56202	.2097	16.023	45734.4	48151.0	259.528	93.40	128.93	223
420.000	1.663	.60134	.1905	18.343	46830.8	49416.5	262.578	94.54	124.59	234
430.000	1.569	.63748	.1755	20.454	47907.8	50649.0	265.478	95.84	122.14	243
440.000	1.490	.67128	.1632	22.406	48976.4	51863.0	268.269	97.23	120.81	251
450.000	1.422	.70329	.1530	24.231	50043.4	53067.5	270.976	98.69	120.20	258
460.000	1.363	.73386	.1444	25.953	51113.0	54268.6	273.616	100.20	120.09	265
470.000	1.310	.76327	.1368	27.590	52188.3	55470.4	276.200	101.73	120.31	272
480.000	1.263	.79171	.1303	29.153	53271.3	56675.7	278.738	103.28	120.79	278
490.000	1.221	.81933	.1244	30.655	54363.6	57886.7	281.235	104.83	121.45	283
500.000	1.182	.84624	.1192	32.102	55466.3	59105.1	283.697	106.40	122.25	289
520.000	1.113	.89832	.1103	34.860	57705.8	61568.6	288.527	109.52	124.16	299
540.000	1.054	.94851	.1028	37.470	59994.4	64073.0	293.253	112.61	126.32	308
560.000	1.003	.99720	.0965	39.959	62334.4	66622.4	297.889	115.66	128.64	317
580.000	.957	1.04467	.0911	42.351	64727.0	69219.1	302.444	118.65	131.05	325
600.000	.916	1.09114	.0863	44.661	67172.6	71864.5	306.928	121.58	133.50	333
620.000	.880	1.13677	.0821	46.903	69671.0	74559.1	311.346	124.44	135.96	340
640.000	.846	1.18169	.0784	49.086	72221.7	77303.0	315.701	127.24	138.42	347
660.000	.816	1.22601	.0750	51.219	74824.1	80095.9	319.994	129.96	140.86	354

T	QEN	VOL	DP/DT	DP/DO	E	H	S	CV	CP	W
DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
85.878	16.639	.06010	35.6548	1596.137	5512.4	5776.8	82.670	59.27	83.97	2264
90.000	16.547	.06044	34.0813	1524.700	5857.4	6123.4	86.611	59.14	84.18	2218
100.000	16.323	.06126	30.6723	1369.956	6698.1	6967.7	95.505	58.92	84.69	2113
110.000	16.099	.06212	27.7404	1236.740	7544.0	7817.3	103.602	58.83	85.24	2015
120.000	15.874	.06300	25.1908	1120.586	8395.5	8672.7	111.043	58.87	85.84	1924
130.000	15.649	.06390	22.9532	1018.211	9253.0	9534.2	117.938	59.01	86.48	1839
140.000	15.423	.06484	20.9744	927.141	10117.2	10402.5	124.372	59.26	87.19	1758
150.000	15.197	.06580	19.2126	845.449	10988.7	11278.2	130.413	59.61	87.97	1682
160.000	14.969	.06681	17.6351	771.653	11868.1	12162.1	136.117	60.05	88.83	1608
170.000	14.739	.06785	16.2152	704.547	12756.5	13055.0	141.530	60.57	89.78	1538
180.000	14.508	.06893	14.9310	643.159	13654.7	13957.9	146.691	61.18	90.83	1471
190.000	14.275	.07005	13.7643	586.692	14563.7	14871.9	151.632	61.88	91.99	1406
200.000	14.039	.07123	12.6997	534.490	15484.6	15798.1	156.382	62.65	93.27	1343
210.000	13.800	.07247	11.7240	486.007	16418.9	16737.8	160.966	63.51	94.69	1281
220.000	13.556	.07377	10.8259	440.791	17367.8	17692.4	165.407	64.44	96.27	1222
230.000	13.308	.07514	9.9956	398.467	18333.0	18663.6	169.724	65.45	98.01	1163
240.000	13.054	.07660	9.2244	358.718	19324.6	19661.7	173.984	66.54	99.94	1105
250.000	12.793	.07817	8.5045	321.294	20339.7	20683.6	178.168	67.70	102.08	1048
260.000	12.524	.07984	7.8290	285.980	21377.4	21728.7	182.279	68.94	104.47	991
270.000	12.245	.08166	7.1916	252.600	22438.5	22797.8	186.325	70.26	107.12	934
280.000	11.954	.08365	6.5863	221.014	23524.3	23892.4	190.315	71.65	110.11	877
290.000	11.648	.08585	6.0076	191.102	24637.4	25015.1	194.262	73.11	113.48	820
300.000	11.324	.08831	5.4501	162.772	25781.1	26159.6	198.182	74.65	117.34	761
310.000	10.977	.09110	4.9082	135.946	26960.9	27361.8	202.095	76.25	121.85	701
320.000	10.599	.09435	4.3761	110.563	28185.5	28600.1	206.031	77.92	127.26	639
330.000	10.180	.09823	3.8468	86.576	29465.5	29897.7	210.027	79.63	134.05	574
340.000	9.702	.10307	3.3113	63.946	30822.0	31275.5	214.143	81.36	143.29	505
350.000	9.127	.10956	2.7544	42.634	32290.2	32772.2	218.485	83.05	157.81	428
360.000	8.357	.11966	2.1412	22.558	33960.0	34486.5	223.316	84.95	189.72	338
370.000	6.732	.14855	1.2731	3.281	36433.2	37086.8	230.411	90.88	494.19	201
380.000	2.673	.37407	.3714	5.713	41725.5	43371.4	247.262	93.85	222.23	175
390.000	2.244	.44565	.2903	9.745	43243.0	45203.8	252.025	92.52	159.50	195
400.000	2.006	.49839	.2475	12.892	44494.4	46687.3	255.782	92.77	139.99	210
410.000	1.843	.54271	.2192	15.570	45648.7	48036.6	259.114	93.59	130.86	222
420.000	1.718	.58205	.1985	17.942	46757.1	49318.2	262.203	94.69	125.94	232
430.000	1.618	.61805	.1824	20.095	47842.8	50562.3	265.130	95.97	123.15	241
440.000	1.535	.65162	.1694	22.082	48918.1	51785.2	267.942	97.34	121.61	250
450.000	1.463	.68333	.1585	23.937	49990.3	52997.0	270.665	98.79	120.85	257
460.000	1.401	.71358	.1494	25.684	51064.2	54204.0	273.318	100.28	120.63	264
470.000	1.347	.74263	.1415	27.343	52143.1	55410.7	275.913	101.80	120.77	271
480.000	1.298	.77070	.1345	28.927	53229.2	56620.3	278.460	103.34	121.18	277
490.000	1.253	.79793	.1284	30.447	54324.1	57835.0	280.965	104.90	121.80	283
500.000	1.213	.82445	.1230	31.910	55429.1	59056.7	283.433	106.45	122.56	288
520.000	1.142	.87570	.1136	34.697	57672.6	61525.7	288.274	109.56	124.40	298
540.000	1.081	.92505	.059	37.331	59364.3	64034.5	293.008	112.65	126.52	308
560.000	1.028	.97288	.0993	39.841	62306.9	66587.6	297.650	115.69	128.81	317
580.000	.981	1.01949	.0936	42.251	64701.7	69187.5	302.212	118.68	131.19	325
600.000	.939	1.06509	.0887	44.576	67149.1	71835.5	306.700	121.60	133.62	333
620.000	.901	1.10985	.0844	46.832	69649.1	74532.5	311.122	124.47	136.07	340
640.000	.867	1.15390	.0805	49.027	72201.3	77278.4	315.481	127.26	138.52	347
660.000	.835	1.19733	.0770	51.171	74804.9	80073.2	319.780	129.98	140.95	354
680.000	.806	1.24024	.0739	53.270	77459.2	82916.3	324.024	132.63	143.35	361
700.000	.780	1.28270	.0710	55.331	80163.2	85807.1	328.214	135.22	145.72	367



Table 30. Continued.

PROPANE ISOBAR AT P = 46 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/00 BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	M M/SEC
85.896	16.640	.06010	35.6695	1597.795	5512.5	5789.0	82.672	59.27	83.97	2265
90.000	16.548	.06043	34.1028	1526.643	5856.0	6134.0	86.594	59.14	84.17	2219
100.000	16.324	.06126	30.6927	1371.800	6696.5	6978.3	95.488	58.92	84.69	2114
110.000	16.100	.06211	27.7599	1238.504	7542.1	7827.8	103.584	58.83	85.24	2017
120.000	15.876	.06299	25.2095	1122.283	8393.4	8683.1	111.025	58.87	85.83	1926
130.000	15.651	.06389	22.9713	1019.854	9250.7	9544.6	117.920	59.01	86.47	1840
140.000	15.426	.06483	20.9919	928.738	10114.6	10412.8	124.353	59.26	87.18	1760
150.000	15.199	.06579	19.2297	847.008	10985.8	11288.4	130.394	59.61	87.96	1683
160.000	14.971	.06679	17.6518	773.181	11864.9	12172.2	136.097	60.05	88.81	1610
170.000	14.742	.06783	16.2316	706.049	12753.0	13055.0	141.509	60.57	89.76	1540
180.000	14.511	.06891	14.9471	644.639	13650.8	13967.7	146.669	61.18	90.81	1472
190.000	14.278	.07004	13.7802	588.156	14559.4	14881.5	151.609	61.88	91.97	1407
200.000	14.043	.07121	12.7153	535.941	15479.9	15807.5	156.358	62.65	93.25	1344
210.000	13.804	.07244	11.7395	487.450	16413.7	16746.9	160.941	63.51	94.67	1283
220.000	13.561	.07374	10.8414	442.231	17362.1	17701.3	165.380	64.44	96.24	1223
230.000	13.313	.07511	10.0111	399.906	18326.6	18672.2	169.696	65.45	97.97	1165
240.000	13.060	.07657	9.2400	360.163	19317.5	19669.8	173.954	66.54	99.89	1107
250.000	12.800	.07813	8.5204	322.748	20331.8	20691.2	178.136	67.70	102.03	1050
260.000	12.531	.07980	7.8452	287.448	21368.5	21735.6	182.244	68.94	104.39	993
270.000	12.253	.08161	7.2083	254.089	22428.5	22803.9	186.287	70.26	107.03	936
280.000	11.963	.08359	6.6037	222.529	23513.0	23897.5	190.273	71.65	109.99	880
290.000	11.659	.08577	6.0259	192.652	24624.3	25018.9	194.216	73.12	113.33	822
300.000	11.336	.08821	5.4696	164.366	25765.9	26171.7	198.130	74.65	117.14	764
310.000	10.991	.09098	4.9295	137.597	26943.0	27361.5	202.036	76.26	121.58	705
320.000	10.617	.09419	4.3998	112.288	28163.3	28596.5	205.961	77.92	126.86	643
330.000	10.203	.09801	3.8740	88.396	29438.5	29889.3	209.942	79.63	133.45	579
340.000	9.733	.10274	3.3438	65.897	30786.6	31259.2	214.035	81.35	142.25	511
350.000	9.173	.10902	2.7962	44.773	32239.5	32741.0	218.333	83.03	155.67	436
360.000	8.441	.11847	2.2032	25.013	33872.1	34417.0	223.057	84.85	182.91	349
370.000	7.148	.13990	1.4529	6.610	36037.1	36680.6	229.236	89.29	320.56	231
380.000	3.085	.32412	.4462	4.089	41178.0	42668.9	245.229	95.72	290.11	167
390.000	2.463	.40594	.3275	8.505	42944.2	44811.5	250.801	93.34	174.40	189
400.000	2.168	.46121	.2735	11.854	44274.8	46396.4	254.815	93.31	146.99	205
410.000	1.975	.50634	.2395	14.669	45470.7	47799.9	258.281	93.99	135.09	218
420.000	1.832	.54583	.2153	17.145	46605.7	49116.5	261.454	95.01	128.84	229
430.000	1.719	.58162	.1968	19.382	47710.0	50385.5	264.440	96.23	125.30	239
440.000	1.627	.61479	.1821	21.438	48799.3	51627.4	267.295	97.56	123.28	247
450.000	1.548	.64599	.1699	23.352	49882.6	52854.1	270.052	98.98	122.20	255
460.000	1.480	.67564	.1597	25.151	50965.5	54073.4	272.732	100.45	121.74	262
470.000	1.420	.70405	.1509	26.855	52051.8	55290.4	275.350	101.95	121.72	269
480.000	1.367	.73142	.1433	28.479	53144.2	56508.7	277.915	103.48	122.00	275
490.000	1.319	.75793	.1366	30.034	54244.6	57731.0	280.435	105.02	122.50	281
500.000	1.276	.78371	.1306	31.531	55354.3	58959.3	282.916	106.57	123.18	287
510.000	1.200	.83344	.1204	34.375	57605.7	61439.5	287.780	109.66	124.90	297
520.000	1.135	.88121	.1120	37.056	59903.8	63957.4	292.531	112.73	126.93	307
530.000	1.078	.92745	.1049	39.608	62251.6	66517.9	297.187	115.76	129.15	316
540.000	1.028	.97245	.0988	42.053	64650.9	69124.1	301.759	118.74	131.48	324
550.000	.984	1.01643	.0936	44.410	67102.1	71777.7	306.257	121.66	133.88	332
560.000	.944	1.05956	.0889	46.693	69605.4	74479.3	310.686	124.51	136.30	340
570.000	.907	1.10196	.0848	48.913	72160.4	77229.4	315.052	127.30	138.72	347
580.000	.874	1.14376	.0811	51.078	74766.0	80000.0	319.800	129.80	141.20	354

DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
85.915	16.640	.06009	35.6841	1599.454	5512.7	5801.2	82.674	59.27	83.97	2266
90.000	16.549	.06043	34.1243	1528.587	5854.6	6144.6	86.578	59.14	84.17	2221
100.000	16.326	.06125	30.7130	1373.644	6694.8	6988.8	95.472	58.92	84.68	2115
110.000	16.102	.06210	27.7794	1240.268	7540.3	7838.4	103.567	58.83	85.23	2018
120.000	15.878	.06298	25.2282	1123.981	8391.3	8693.6	111.007	58.87	85.82	1927
130.000	15.653	.06389	22.9894	1021.497	9248.9	9555.0	117.901	59.01	86.47	1842
140.000	15.428	.06482	21.0095	930.336	10111.9	10423.1	124.334	59.26	87.17	1761
150.000	15.201	.06578	19.2468	848.568	10982.9	11298.6	130.374	59.61	87.95	1684
160.000	14.974	.06678	17.6685	774.709	11861.7	12182.3	136.077	60.05	88.80	1611
170.000	14.745	.06782	16.2479	707.551	12749.4	13075.0	141.488	60.57	89.75	1541
180.000	14.515	.06890	14.9632	646.119	13646.9	13977.6	146.647	61.19	90.79	1474
190.000	14.282	.07002	13.7960	589.619	14555.1	14891.2	151.586	61.88	91.95	1409
200.000	14.046	.07119	12.7310	537.392	15475.2	15816.9	156.334	62.65	93.23	1346
210.000	13.808	.07242	11.7551	488.893	16408.5	16756.1	160.916	63.51	94.64	1285
220.000	13.565	.07372	10.8569	443.669	17356.3	17710.2	165.354	64.44	96.20	1225
230.000	13.318	.07509	10.0267	401.345	18320.3	18680.7	169.668	65.45	97.93	1166
240.000	13.065	.07654	9.2556	361.606	19310.5	19677.9	173.923	66.54	99.85	1109
250.000	12.806	.07809	8.5362	324.200	20323.9	20698.8	178.103	67.70	101.97	1052
260.000	12.538	.07976	7.8614	288.914	21359.7	21742.5	182.209	68.94	104.32	995
270.000	12.261	.08156	7.2249	255.575	22410.5	22810.0	186.249	70.26	106.94	939
280.000	11.972	.08353	6.6210	224.041	23501.7	23902.6	190.232	71.65	109.88	882
290.000	11.669	.08570	6.0441	194.198	24611.4	25022.7	194.170	73.12	113.18	825
300.000	11.348	.08812	5.4891	165.955	25750.9	26173.9	198.078	74.66	116.95	767
310.000	11.006	.09086	4.9506	139.241	26925.3	27361.4	201.977	76.26	121.31	708
320.000	10.635	.09403	4.4232	114.002	28141.9	28593.3	205.892	77.93	126.49	647
330.000	10.226	.09779	3.9008	90.201	29411.9	29881.3	209.859	79.64	132.87	584
340.000	9.763	.10243	3.3757	67.824	30752.1	31243.7	213.929	81.35	141.28	516
350.000	9.217	.10850	2.8364	46.872	32191.1	32711.9	218.188	83.01	153.73	443
360.000	8.517	.11741	2.2607	27.381	33791.7	34355.3	222.820	84.78	177.41	360
370.000	7.398	.13518	1.5758	9.523	35794.7	36443.6	228.521	88.63	264.91	254
380.000	3.699	.27035	.5595	2.596	40410.6	41708.3	242.544	98.09	433.02	161
390.000	2.717	.36801	.3717	7.289	42606.6	44373.0	249.478	94.24	194.34	184
400.000	2.345	.42650	.3025	10.832	44038.7	46085.9	253.817	93.87	155.34	201
410.000	2.116	.47268	.2616	13.781	45283.5	47552.4	257.439	94.40	139.88	215
420.000	1.952	.51243	.2333	16.359	46448.3	48907.9	260.706	95.33	132.03	226
430.000	1.824	.54811	.2121	18.677	47573.1	50204.1	263.756	96.49	127.61	236
440.000	1.721	.58097	.1954	20.801	48677.6	51466.2	266.657	97.79	125.05	245
450.000	1.635	.61172	.1818	22.773	49772.6	52708.8	269.450	99.18	123.62	253
460.000	1.560	.64084	.1704	24.623	50864.9	53941.0	272.158	100.62	122.91	261
470.000	1.496	.66867	.1608	26.372	51959.1	55168.7	274.799	102.11	122.70	268
480.000	1.438	.69542	.1524	28.036	53058.0	56396.1	277.383	103.62	122.84	274
490.000	1.386	.72128	.1450	29.628	54164.1	57626.2	279.919	105.14	123.23	280
500.000	1.340	.74638	.1385	31.157	55278.7	58861.3	282.414	106.68	123.82	286
520.000	1.258	.79472	.1274	34.057	57538.2	61352.9	287.300	109.75	125.41	297
540.000	1.189	.84107	.1183	36.786	59842.9	63880.0	292.069	112.81	127.35	306
560.000	1.129	.88585	.1107	39.379	62196.1	66448.2	296.739	115.83	129.50	315
580.000	1.076	.92937	.1041	41.860	64599.8	69060.8	301.322	118.80	131.78	324
600.000	1.029	.97186	.0985	44.249	67054.9	71719.8	305.829	121.71	134.13	332
620.000	.987	1.01349	.0935	46.559	69561.5	74426.3	310.266	124.56	136.52	340
640.000	.943	1.05440	.0891	48.804	72119.4	77180.6	314.638	127.35	138.91	347
660.000	.913	1.09469	.0851	50.992	74728.2	79982.7	318.950	130.06	141.30	354
680.000	.881	1.13445	.0816	53.130	77387.0	82832.4	323.203	132.70	143.66	361
700.000	.852	1.17375	.0783	55.226	80095.0	85729.0	327.401	135.28	146.00	367



Table 30. Continued.

PROPANE ISOBAR AT P = 50 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DI BAR/K	DP/DO BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W W/SEC
85.934	16.641	.06009	35.6988	1601.113	5512.9	5813.4	82.676	59.27	83.97	2268
90.000	16.551	.06042	34.1457	1530.531	5853.1	6155.2	86.562	59.14	84.17	2222
100.000	16.327	.06125	30.7334	1375.488	6693.2	6999.4	95.455	58.92	84.68	2117
110.000	16.104	.06210	27.7989	1242.031	7538.4	7848.9	103.550	58.83	85.22	2019
120.000	15.880	.06297	25.2470	1125.679	8389.2	8704.0	110.990	58.87	85.82	1929
130.000	15.655	.06388	23.0075	1023.140	9246.0	9565.3	117.883	59.02	86.46	1843
140.000	15.430	.06481	21.0270	931.933	10109.3	10433.4	124.315	59.26	87.16	1763
150.000	15.204	.06577	19.2638	850.127	10980.0	11308.8	130.354	59.61	87.94	1686
160.000	14.977	.06677	17.6852	776.236	11858.5	12192.4	136.056	60.05	88.79	1613
170.000	14.748	.06781	16.2643	709.052	12745.9	13084.9	141.467	60.57	89.73	1543
180.000	14.518	.06888	14.9792	647.599	13643.0	13987.4	146.625	61.19	90.78	1476
190.000	14.285	.07000	13.8118	591.082	14550.8	14900.8	151.563	61.88	91.93	1411
200.000	14.050	.07117	12.7466	538.842	15470.5	15826.4	156.310	62.65	93.20	1348
210.000	13.812	.07240	11.7706	490.335	16403.3	16765.3	160.891	63.51	94.61	1287
220.000	13.570	.07369	10.8724	445.107	17350.6	17719.1	165.327	64.44	96.17	1227
230.000	13.323	.07506	10.0422	402.782	18314.0	18689.2	169.639	65.45	97.89	1168
240.000	13.071	.07651	9.2712	363.048	19303.5	19686.0	173.894	66.54	99.80	1111
250.000	12.812	.07805	8.5520	325.651	20316.1	20706.4	178.071	67.71	101.91	1054
260.000	12.545	.07971	7.8775	290.378	21350.9	21749.5	182.175	68.95	104.25	997
270.000	12.269	.08151	7.2415	257.058	22408.7	22816.2	186.211	70.26	106.86	941
280.000	11.981	.08347	6.6382	225.550	23490.5	23907.8	190.191	71.66	109.77	885
290.000	11.679	.08562	6.0622	195.740	24598.5	25026.7	194.124	73.12	113.04	828
300.000	11.360	.08803	5.5084	167.539	25736.0	26176.1	198.027	74.66	116.76	770
310.000	11.020	.09074	4.9715	140.877	26907.7	27361.4	201.918	76.27	121.05	712
320.000	10.652	.09388	4.4464	115.706	28120.9	28590.2	205.824	77.93	126.12	651
330.000	10.248	.09758	3.9272	91.992	29385.9	29873.8	209.777	79.64	132.32	588
340.000	9.792	.10212	3.4068	69.729	30718.5	31229.1	213.826	81.35	140.37	522
350.000	9.258	.10801	2.8753	48.934	32144.5	32684.6	218.048	83.00	151.98	450
360.000	8.587	.11645	2.3145	29.676	33717.4	34299.7	222.601	84.72	172.84	370
370.000	7.583	.13188	1.6741	12.210	35613.0	36272.4	227.986	88.25	235.97	272
380.000	4.637	.21566	.7391	1.946	39345.4	40423.7	239.036	100.01	596.03	162
390.000	3.016	.33153	.4249	6.134	42220.0	43877.6	248.028	95.21	221.40	179
400.000	2.538	.39395	.3352	9.840	43783.7	45753.5	252.780	94.45	165.33	197
410.000	2.266	.44140	.2857	12.913	45086.2	47293.2	256.584	94.82	145.31	211
420.000	2.077	.48152	.2526	15.587	46284.7	48692.3	259.955	95.66	135.53	223
430.000	1.934	.51718	.2283	17.985	47432.0	50017.9	263.075	96.76	130.10	234
440.000	1.819	.54978	.2095	20.175	48552.8	51301.7	266.027	98.02	126.94	243
450.000	1.724	.58016	.1943	22.204	49660.3	52561.1	268.857	99.37	125.11	251
460.000	1.643	.60881	.1816	24.104	50762.6	53806.7	271.595	100.79	124.13	259
470.000	1.572	.63611	.1709	25.897	51864.9	55045.5	274.259	102.26	123.72	266
480.000	1.510	.66230	.1617	27.600	52970.8	56282.3	276.863	103.75	123.70	273
490.000	1.454	.68757	.1537	29.227	54082.7	57520.5	279.416	105.27	123.98	279
500.000	1.404	.71206	.1466	30.788	55202.4	58762.7	281.926	106.79	124.48	285
510.000	1.317	.75913	.1346	33.745	57470.3	61265.9	286.834	109.85	125.93	296
520.000	1.244	.80416	.1247	36.522	59781.6	63802.4	291.620	112.89	127.77	306
530.000	1.180	.84760	.1165	39.155	62140.3	66378.3	296.304	115.90	129.85	315
540.000	1.124	.88977	.1095	41.672	64548.5	68997.4	300.899	119.86	132.08	324
550.000	1.074	.93090	.1035	44.091	67007.5	71662.0	305.416	121.77	134.39	332
560.000	1.030	.97115	.0981	46.434	69517.5	74373.2	309.861	124.61	136.74	339
570.000	.989	1.01068	.0934	48.699	72078.4	77131.8	314.240	127.39	139.11	347
580.000	.953	1.04959	.0893	50.904	74649.1	79837.4	318.557	130.14	141.54	354

DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
85.952	16.642	.06009	35.7134	1602.772	5513.1	5825.6	82.678	59.27	83.96	2269
90.000	16.552	.06042	34.1672	1532.475	5851.7	6165.8	86.546	59.14	84.16	2223
100.000	16.329	.06124	30.7538	1377.332	6691.5	7010.0	95.438	58.92	84.67	2118
110.000	16.105	.06209	27.8183	1243.795	7536.5	7859.4	103.532	58.83	85.22	2021
120.000	15.881	.06297	25.2657	1127.376	8387.1	8714.5	110.972	58.87	85.81	1930
130.000	15.657	.06387	23.0255	1024.783	9243.6	9575.7	117.865	59.02	86.45	1845
140.000	15.432	.06480	21.0445	933.530	10106.7	10443.7	124.296	59.26	87.15	1764
150.000	15.206	.06576	19.2809	851.686	10977.1	11319.0	130.335	59.61	87.93	1687
160.000	14.979	.06676	17.7018	777.764	11855.4	12202.5	136.036	60.05	88.78	1614
170.000	14.751	.06779	16.2806	710.552	12742.4	13094.9	141.446	60.58	89.72	1544
180.000	14.521	.06887	14.9953	649.078	13639.1	13997.2	146.603	61.19	90.76	1477
190.000	14.289	.06999	13.8276	592.544	14546.5	14910.5	151.540	61.88	91.91	1412
200.000	14.054	.07116	12.7623	540.292	15465.8	15835.8	156.286	62.65	93.18	1349
210.000	13.816	.07238	11.7861	491.776	16398.1	16774.5	160.865	63.51	94.59	1288
220.000	13.574	.07367	10.8878	446.543	17344.9	17728.0	165.301	64.44	96.14	1229
230.000	13.328	.07503	10.0576	404.219	18307.6	18697.8	169.611	65.45	97.86	1170
240.000	13.076	.07647	9.2868	364.492	19296.4	19694.1	173.864	66.54	99.75	1113
250.000	12.818	.07802	8.5677	327.100	20308.3	20714.0	178.039	67.71	101.85	1056
260.000	12.552	.07967	7.8935	291.840	21342.2	21756.5	182.140	68.95	104.18	999
270.000	12.277	.08146	7.2580	258.539	22398.8	22822.4	186.174	70.27	106.77	943
280.000	11.990	.08340	6.6553	227.055	23479.4	23913.1	190.150	71.66	109.66	887
290.000	11.689	.08555	6.0802	197.278	24585.8	25030.6	194.079	73.13	112.90	831
300.000	11.372	.08793	5.5275	169.117	25721.2	26178.5	197.976	74.67	116.57	773
310.000	11.034	.09063	4.9923	142.507	26890.4	27361.7	201.861	76.27	120.80	715
320.000	10.669	.09373	4.4693	117.400	28100.1	28587.5	205.756	77.94	125.77	655
330.000	10.269	.09738	3.9532	93.770	29360.3	29866.7	209.696	79.84	131.79	593
340.000	9.820	.10183	3.4373	71.614	30685.7	31215.3	213.725	81.35	139.52	527
350.000	9.298	.10754	2.9130	50.963	32099.8	32659.0	217.914	82.99	150.39	457
360.000	8.652	.11558	2.3652	31.909	33648.2	34249.2	222.396	84.67	168.97	380
370.000	7.731	.12934	1.7581	14.744	35464.9	36137.5	227.551	88.00	217.76	287
380.000	5.570	.17953	.9458	2.521	38472.0	39405.5	236.248	93.44	527.95	179
390.000	3.374	.29637	.4901	5.104	41773.8	43314.9	246.424	96.22	257.43	175
400.000	2.752	.36335	.3720	8.893	43507.6	45397.0	251.700	95.06	177.25	193
410.000	2.426	.41225	.3120	12.072	44878.1	47021.8	255.714	95.25	151.43	208
420.000	2.208	.45284	.2733	14.836	46114.4	48469.2	259.202	95.99	139.36	221
430.000	2.047	.48853	.2455	17.308	47286.5	49826.9	262.397	97.03	132.78	231
440.000	1.920	.52095	.2243	19.562	48424.9	51133.8	265.402	98.24	128.94	241
450.000	1.815	.55099	.2073	21.646	49545.7	52410.9	268.272	99.57	126.68	249
460.000	1.726	.57924	.1933	23.594	50658.6	53670.6	271.041	100.96	125.40	257
470.000	1.650	.60607	.1815	25.430	51769.5	54921.0	273.730	102.41	124.77	265
480.000	1.583	.63175	.1714	27.172	52882.4	56167.5	276.354	103.89	124.60	271
490.000	1.523	.65647	.1626	28.834	54000.4	57414.0	278.925	105.39	124.76	278
500.000	1.470	.68040	.1549	30.426	55125.3	58663.4	281.449	106.90	125.15	284
520.000	1.377	.72630	.1419	33.438	57401.8	61178.6	286.381	109.94	126.46	295
540.000	1.298	.77012	.1313	36.262	59719.9	63724.6	291.185	112.97	128.20	305
560.000	1.231	.81233	.1225	38.937	62084.2	66308.3	295.883	115.97	130.21	314
580.000	1.172	.85325	.1150	41.488	64497.1	68934.0	300.490	118.92	132.38	323
600.000	1.120	.89312	.1085	43.939	66960.0	71604.2	305.016	121.82	134.65	331
620.000	1.073	.93211	.1029	46.305	69473.3	74320.3	309.469	124.66	136.97	339
640.000	1.031	.97036	.0979	48.599	72037.2	77083.1	313.854	127.43	139.31	347
660.000	.992	1.00799	.0934	50.830	74651.1	79892.1	318.177	130.14	141.65	354
680.000	.957	1.04509	.0894	53.008	77314.5	82749.0	322.440	132.78	143.98	361
700.000	.924	1.08171	.0858	55.140	80026.7	85651.7	326.647	135.35	146.28	367



Table 30. Continued.

## PROPANE ISOBAR AT P = 55 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DI BAR/K	DP/DO BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
85.980	16.643	.06008	35.7354	1605.260	5513.4	5843.8	82.681	59.26	83.96	2270
90.000	16.554	.06041	34.1993	1535.391	5849.5	6181.8	86.521	59.14	84.15	2225
100.000	16.331	.06123	30.7843	1380.099	6689.1	7025.8	95.413	58.92	84.67	2120
110.000	16.108	.06208	27.8475	1246.440	7533.7	7875.2	103.507	58.83	85.21	2023
120.000	15.884	.06296	25.2937	1129.923	8383.9	8730.2	110.945	58.87	85.80	1932
130.000	15.660	.06386	23.0526	1027.247	9240.1	9591.3	117.837	59.02	86.44	1847
140.000	15.435	.06479	21.0708	935.925	10102.8	10459.2	124.268	59.27	87.14	1766
150.000	15.210	.06575	19.3065	854.024	10972.8	11334.4	130.305	59.61	87.91	1690
160.000	14.983	.06674	17.7268	780.054	11850.6	12217.7	136.006	60.05	88.76	1617
170.000	14.755	.06777	16.3051	712.803	12737.1	13109.9	141.414	60.58	89.70	1547
180.000	14.525	.06885	15.0193	651.297	13633.3	14012.0	146.570	61.19	90.74	1479
190.000	14.294	.06996	13.8513	594.737	14540.2	14924.9	151.506	61.88	91.88	1415
200.000	14.059	.07113	12.7857	542.465	15458.8	15850.0	156.250	62.66	93.15	1352
210.000	13.822	.07235	11.8093	493.936	16390.4	16788.3	160.828	63.51	94.55	1291
220.000	13.581	.07363	10.9110	448.697	17336.4	17741.4	165.261	64.44	96.09	1231
230.000	13.335	.07499	10.0808	406.372	18298.2	18710.7	169.570	65.46	97.80	1173
240.000	13.085	.07643	9.3101	366.650	19286.0	19706.3	173.819	66.54	99.68	1116
250.000	12.827	.07796	8.5913	329.270	20296.7	20725.4	177.992	67.71	101.77	1059
260.000	12.562	.07960	7.9176	294.030	21329.2	21767.0	182.089	68.95	104.08	1003
270.000	12.288	.08138	7.2827	260.756	22384.2	22831.8	186.118	70.27	106.64	947
280.000	12.003	.08331	6.6809	229.308	23462.8	23921.0	190.089	71.67	109.50	891
290.000	11.705	.08544	6.1071	199.577	24566.9	25036.8	194.012	73.13	112.69	835
300.000	11.390	.08780	5.5561	171.475	25699.4	26182.2	197.901	74.67	116.30	778
310.000	11.055	.09046	5.0231	144.938	26864.7	27362.2	201.775	76.28	120.44	720
320.000	10.695	.09351	4.5033	119.924	28069.5	28583.7	205.657	77.94	125.25	661
330.000	10.301	.09708	3.9915	96.411	29322.8	29856.8	209.578	79.65	131.04	599
340.000	9.861	.10140	3.4819	74.405	30638.1	31195.8	213.578	81.35	138.32	535
350.000	9.356	.10689	2.9674	53.950	32035.7	32623.5	217.720	82.97	148.23	467
360.000	8.742	.11439	2.4365	35.158	33552.3	34181.5	222.112	84.60	164.15	393
370.000	7.913	.12637	1.8667	18.339	35281.5	35976.5	227.012	87.74	200.00	307
380.000	6.415	.15587	1.1908	5.120	37648.7	38506.0	233.750	92.14	347.88	209
390.000	4.041	.24747	.6158	4.076	40988.9	42350.0	243.741	97.56	319.77	174
400.000	3.117	.32080	.4368	7.614	43049.5	44813.9	249.986	95.97	199.13	189
410.000	2.687	.37210	.3562	10.888	44544.3	46590.8	254.375	95.90	162.06	204
420.000	2.418	.41352	.3073	13.761	45846.2	48120.6	258.063	96.49	145.78	217
430.000	2.225	.44936	.2733	16.332	47059.7	49531.2	261.382	97.44	137.16	228
440.000	2.077	.48157	.2479	18.673	48227.0	50875.6	264.473	98.58	132.17	238
450.000	1.956	.51120	.2279	20.835	49369.4	52181.0	267.407	99.86	129.17	247
460.000	1.856	.53891	.2116	22.851	50499.1	53463.1	270.225	101.22	127.40	255
470.000	1.770	.56511	.1981	24.749	51623.6	54731.7	272.953	102.63	126.42	262
480.000	1.695	.59010	.1865	26.546	52747.8	55993.4	275.610	104.09	125.99	269
490.000	1.628	.61410	.1765	28.259	53875.5	57252.8	278.207	105.57	125.95	276
500.000	1.569	.63727	.1678	29.897	55008.3	58513.3	280.753	107.07	126.19	282
520.000	1.467	.68159	.1532	32.991	57298.2	61046.9	285.722	110.08	127.27	294
540.000	1.382	.72377	.1414	35.884	59626.8	63607.5	290.553	113.09	128.86	304
560.000	1.308	.76430	.1316	38.618	61999.5	66203.2	295.273	116.07	130.75	314
580.000	1.245	.80352	.1234	41.223	64419.5	68838.9	299.897	119.01	132.84	323
600.000	1.188	.84166	.1163	43.719	66888.4	71517.6	304.438	121.90	135.04	331
620.000	1.138	.87893	.1101	46.126	69406.9	74241.0	308.903	124.73	137.31	339
640.000	1.092	.91545	.1046	48.456	71975.3	77041.0	313.206	127.50	139.60	347

DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	M/SEC
86.026	16.645	.06008	35.7719	1609.406	5513.9	5874.3	82.686	59.26	83.95
90.000	16.557	.06040	34.2529	1540.253	5845.9	6208.3	86.481	59.14	84.14
100.000	16.335	.06122	30.8351	1384.711	6685.0	7052.3	95.371	58.92	84.65
110.000	16.112	.06207	27.8960	1250.850	7529.1	7901.5	103.464	58.83	85.20
120.000	15.888	.06294	25.3404	1134.167	8378.7	8756.3	110.901	58.87	85.78
130.000	15.665	.06384	23.0977	1031.353	9234.3	9617.3	117.791	59.02	86.42
140.000	15.440	.06476	21.1145	939.917	10096.4	10484.9	124.221	59.27	87.12
150.000	15.215	.06572	19.3490	857.921	10965.6	11359.9	130.257	59.61	87.89
160.000	14.989	.06671	17.7684	783.870	11842.7	12242.9	135.955	60.05	88.73
170.000	14.762	.06774	16.3457	716.552	12728.4	13134.8	141.362	60.58	89.67
180.000	14.533	.06881	15.0593	654.992	13623.7	14036.6	146.515	61.19	90.70
190.000	14.302	.06992	13.8907	598.389	14529.6	14949.1	151.449	61.88	91.83
200.000	14.069	.07108	12.8246	546.085	15447.2	15873.6	156.191	62.66	93.09
210.000	13.832	.07230	11.8479	497.534	16377.6	16811.4	160.765	63.51	94.48
220.000	13.592	.07357	10.9494	452.282	17322.3	17763.7	165.195	64.45	96.01
230.000	13.348	.07492	10.1192	409.954	18282.6	18732.1	169.500	65.46	97.71
240.000	13.098	.07635	9.3488	370.240	19268.7	19726.8	173.745	66.55	99.57
250.000	12.842	.07787	8.6304	332.880	20277.5	20744.7	177.913	67.72	101.63
260.000	12.579	.07950	7.9574	297.670	21307.8	21784.7	182.004	68.96	103.91
270.000	12.307	.08125	7.3236	264.438	22360.1	22847.6	186.026	70.28	106.43
280.000	12.025	.08316	6.7233	233.047	23435.5	23934.5	189.988	71.67	109.23
290.000	11.729	.08526	6.1514	203.389	24535.8	25047.3	193.901	73.14	112.36
300.000	11.419	.08758	5.6031	175.380	25663.5	26189.0	197.777	74.68	115.87
310.000	11.089	.09018	5.0738	148.958	26822.9	27364.0	201.635	76.29	119.86
320.000	10.736	.09315	4.5588	124.087	28019.8	28578.7	205.495	77.95	124.45
330.000	10.352	.09660	4.0537	100.753	29262.4	29842.0	209.386	79.65	129.88
340.000	9.927	.10074	3.5536	78.969	30562.3	31166.7	213.344	81.35	136.53
350.000	9.444	.10588	3.0532	58.794	31935.6	32570.9	217.418	82.95	145.17
360.000	8.874	.11268	2.5452	40.353	33408.9	34085.0	221.687	84.53	157.91
370.000	8.151	.12269	2.0186	23.942	35038.2	35774.3	226.298	87.46	182.25
380.000	7.085	.14115	1.4520	10.482	36999.1	37846.0	231.819	91.02	243.30
390.000	5.258	.19020	.8746	4.538	39726.1	40867.3	239.661	94.70	332.52
400.000	3.855	.25938	.5745	6.174	42173.7	43730.0	246.915	97.32	241.15
410.000	3.188	.31370	.4445	9.226	43928.0	45910.2	252.054	96.95	183.37
420.000	2.805	.35648	.3726	12.162	45363.9	47502.8	256.134	97.32	158.24
430.000	2.547	.39266	.3255	14.843	46658.8	49014.7	259.693	98.11	145.42
440.000	2.355	.42465	.2915	17.298	47881.2	50429.1	262.945	99.15	138.11
450.000	2.204	.45374	.2655	19.568	49063.9	51786.4	265.995	100.34	133.70
460.000	2.080	.48070	.2447	21.685	50224.5	53108.8	268.902	101.64	130.99
470.000	1.976	.50603	.2277	23.675	51373.6	54409.8	271.700	103.01	129.36
480.000	1.887	.53005	.2134	25.557	52518.0	55598.3	274.412	104.42	128.45
490.000	1.808	.55301	.2012	27.348	53662.3	56800.4	277.056	105.87	128.04
500.000	1.739	.57509	.1906	29.059	54809.8	58020.4	279.642	107.34	128.00
520.000	1.620	.61713	.1730	32.281	57122.9	60825.7	284.673	110.31	128.67
540.000	1.522	.65695	.1590	35.285	59469.7	63411.4	289.552	113.28	129.98
560.000	1.439	.69506	.1475	38.116	61857.2	66027.5	294.309	116.24	131.68
580.000	1.366	.73182	.1378	40.805	64289.3	68580.2	298.963	119.16	133.62
600.000	1.303	.76749	.1296	43.378	66768.4	71373.3	303.528	122.03	135.71
620.000	1.246	.80226	.1224	45.851	69295.7	74109.3	308.013	124.85	137.89
640.000	1.196	.83627	.1161	48.242	71871.6	76889.3	312.426	127.60	140.12
660.000	1.150	.86965	.1106	50.560	74496.2	79714.1	316.772	130.29	142.37
680.000	1.108	.90247	.1056	52.816	77169.0	82583.9	321.056	132.91	144.62
700.000	1.070	.93483	.1012	55.019	79889.6	85498.6	325.280	135.47	146.85



Table 30. Continued.

PROPANE ISOBAR AT P = 70 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DT BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
86.119	16.650	.06006	35.8447	1617.697	5514.8	5935.3	82.696	59.26	83.94	2279
90.000	16.564	.06037	34.3600	1550.001	5838.8	6261.4	86.399	59.14	84.12	2236
100.000	16.342	.06119	30.9367	1393.957	6676.8	7105.1	95.288	58.92	84.63	2130
110.000	16.120	.06204	27.9930	1259.671	7519.9	7954.1	103.378	58.83	85.17	2033
120.000	15.897	.06290	25.4336	1142.655	8368.3	8808.7	110.813	58.87	85.75	1942
130.000	15.674	.06380	23.1877	1039.565	9222.7	9669.3	117.700	59.02	86.38	1857
140.000	15.451	.06472	21.2018	947.898	10083.5	10536.5	124.127	59.27	87.08	1777
150.000	15.227	.06567	19.4339	865.710	10951.3	11411.0	130.160	59.61	87.84	1700
160.000	15.002	.06666	17.8512	791.497	11826.9	12293.5	135.855	60.05	88.68	1627
170.000	14.776	.06768	16.4269	724.046	12711.1	13184.8	141.257	60.58	89.60	1558
180.000	14.548	.06874	15.1389	662.375	13604.7	14085.8	146.407	61.19	90.62	1491
190.000	14.319	.06984	13.9691	605.685	14508.7	14997.5	151.336	61.89	91.74	1426
200.000	14.087	.07099	12.9021	553.314	15424.1	15921.1	156.073	62.66	92.98	1364
210.000	13.852	.07219	11.9248	504.716	16352.3	16857.6	160.642	63.52	94.35	1303
220.000	13.614	.07345	11.0259	459.437	17294.4	17808.6	165.065	64.45	95.86	1244
230.000	13.372	.07478	10.1957	417.101	18251.9	18775.3	169.362	65.47	97.52	1187
240.000	13.125	.07619	9.4256	377.399	19234.7	19768.0	173.599	66.56	99.35	1130
250.000	12.872	.07769	8.7080	340.071	20239.7	20783.5	177.757	67.72	101.37	1074
260.000	12.612	.07929	8.0363	304.915	21265.6	21820.6	181.837	68.97	103.59	1019
270.000	12.344	.08101	7.4044	271.760	22312.9	22880.0	185.846	70.29	106.04	964
280.000	12.067	.08287	6.8069	240.472	23382.3	23962.4	189.791	71.69	108.74	909
290.000	11.778	.08491	6.2387	210.946	24475.3	25069.6	193.684	73.16	111.73	854
300.000	11.474	.08715	5.6953	183.101	25594.1	26204.2	197.537	74.70	115.06	799
310.000	11.154	.08965	5.1724	156.884	26742.4	27369.9	201.364	76.31	118.80	744
320.000	10.814	.09248	4.6660	132.262	27924.9	28572.3	205.185	77.97	123.02	687
330.000	10.447	.09572	4.1726	109.230	29148.5	29818.6	209.024	79.67	127.87	630
340.000	10.047	.09954	3.6884	87.811	30422.0	31118.7	212.909	81.36	133.54	571
350.000	9.602	.10414	3.2104	68.068	31756.2	32485.2	216.873	82.93	140.41	511
360.000	9.096	.10994	2.7355	50.125	33165.9	33935.5	220.962	84.43	149.39	448
370.000	8.497	.11769	2.2613	34.205	34675.0	35498.8	225.229	87.18	163.78	381
380.000	7.746	.12909	1.7868	20.769	36340.3	37243.9	229.881	90.19	187.53	312
390.000	6.726	.14867	1.3191	10.983	38273.4	39314.1	235.256	93.44	230.01	247
400.000	5.432	.18411	.9204	7.344	40502.4	41791.1	241.526	95.68	252.06	209
410.000	4.387	.22793	.6779	8.092	42562.1	44157.6	247.372	98.36	219.34	202
420.000	3.717	.26905	.5393	10.176	44289.5	46172.8	252.229	98.70	185.61	208
430.000	3.281	.30477	.4538	12.661	45779.5	47912.9	256.325	99.32	164.28	217
440.000	2.975	.33608	.3957	15.132	47134.5	49487.1	259.945	100.19	151.63	227
450.000	2.746	.36419	.3534	17.491	48412.2	50961.5	263.258	101.25	143.87	237
460.000	2.565	.38991	.3209	19.724	49644.4	52373.8	266.363	102.44	138.95	246
470.000	2.417	.41381	.2950	21.839	50849.6	53746.3	269.315	103.72	135.78	254
480.000	2.292	.43627	.2738	23.847	52039.3	55093.2	272.150	105.06	133.77	262
490.000	2.185	.45758	.2559	25.759	53221.1	56424.2	274.895	106.44	132.53	269
500.000	2.092	.47794	.2408	27.587	54400.2	57745.8	277.565	107.86	131.86	276
520.000	1.937	.51638	.2161	31.027	56763.8	60378.5	282.728	110.75	131.62	289
540.000	1.810	.55247	.1969	34.223	59149.5	63016.8	287.706	113.66	132.33	300
560.000	1.704	.58676	.1814	37.233	61568.0	65675.3	292.540	116.57	133.60	311
580.000	1.614	.61966	.1685	40.079	64025.5	68363.1	297.256	119.45	135.23	320
600.000	1.535	.65142	.1577	42.793	66525.9	71085.9	301.871	122.29	137.08	329
620.000	1.466	.68226	.1484	45.393	69071.3	73847.1	306.398	125.07	139.07	338
640.000	1.404	.71232	.1403	47.898	71662.0	76568.3	311.000	127.86	141.00	347

DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	M/SEC
86.211	16.654	.06005	35.9172	1625.987	5515.8	5996.2	82.706	59.26	83.92
90.000	16.570	.06035	34.4664	1559.716	5831.7	6314.5	86.319	59.14	84.10
100.000	16.349	.06117	31.0378	1403.182	6668.7	7158.0	95.205	58.92	84.61
110.000	16.128	.06201	28.0896	1268.493	7510.7	8006.7	103.293	58.84	85.14
120.000	15.906	.06287	25.5265	1151.143	8358.1	8861.0	110.725	58.87	85.72
130.000	15.684	.06376	23.2774	1047.776	9211.2	9721.3	117.610	59.02	86.35
140.000	15.462	.06468	21.2887	955.877	10070.7	10588.2	124.033	59.27	87.04
150.000	15.239	.06562	19.5185	873.494	10937.2	11462.2	130.063	59.62	87.79
160.000	15.015	.06660	17.9338	799.119	11811.4	12344.2	135.755	60.05	88.62
170.000	14.790	.06762	16.5076	731.531	12693.9	13234.9	141.154	60.58	89.53
180.000	14.563	.06867	15.2182	669.749	13585.8	14135.2	146.299	61.19	90.54
190.000	14.335	.06976	14.0472	612.969	14488.0	15046.0	151.224	61.89	91.65
200.000	14.105	.07090	12.9792	560.529	15401.4	15968.6	155.956	62.67	92.88
210.000	13.872	.07209	12.0012	511.881	16327.3	16904.0	160.519	63.52	94.23
220.000	13.636	.07334	11.1019	466.571	17266.9	17853.6	164.936	64.46	95.72
230.000	13.396	.07465	10.2716	424.224	18221.6	18818.8	169.227	65.47	97.35
240.000	13.151	.07604	9.5017	384.528	19201.3	19809.6	173.455	66.56	99.15
250.000	12.901	.07751	8.7848	347.226	20202.7	20822.8	177.604	67.73	101.12
260.000	12.645	.07908	8.1143	312.116	21224.5	21857.1	181.673	68.98	103.28
270.000	12.381	.08077	7.4841	279.028	22266.9	22913.1	185.669	70.30	105.66
280.000	12.108	.08259	6.8890	247.830	23330.6	23991.4	189.599	71.70	108.28
290.000	11.824	.08457	6.3240	218.418	24416.8	25093.4	193.474	73.18	111.16
300.000	11.528	.08675	5.7850	190.716	25527.5	26221.5	197.304	74.72	114.33
310.000	11.217	.08915	5.2678	164.672	26665.6	27378.9	201.104	76.33	117.85
320.000	10.887	.09185	4.7689	140.257	27835.5	28570.3	204.891	77.99	121.77
330.000	10.535	.09492	4.2851	117.470	29042.7	29802.0	208.685	79.69	126.17
340.000	10.155	.09847	3.8138	96.335	30294.1	31081.9	212.509	81.37	131.14
350.000	9.740	.10267	3.3528	76.909	31597.8	32419.1	216.389	82.92	136.84
360.000	9.279	.10777	2.9010	59.296	32962.2	33824.3	220.351	84.38	143.72
370.000	8.755	.11422	2.4586	43.661	34398.6	35312.4	224.412	87.03	153.86
380.000	8.142	.12282	2.0280	30.273	35933.6	36916.1	228.688	89.84	167.72
390.000	7.399	.13515	1.6161	19.614	37605.8	38687.0	233.287	92.75	187.61
400.000	6.489	.15410	1.2411	12.624	39450.0	40582.8	238.338	95.00	210.91
410.000	5.509	.18151	.9434	10.203	41394.0	42846.0	243.680	98.44	216.26
420.000	4.698	.21287	.7440	10.658	43219.6	44922.6	248.685	99.32	198.17
430.000	4.100	.24392	.6128	12.099	44858.0	46809.3	253.125	100.12	179.52
440.000	3.665	.27282	.5232	14.089	46343.4	48526.0	257.072	101.00	164.62
450.000	3.342	.29925	.4591	16.255	47722.9	50116.9	260.648	102.00	154.25
460.000	3.091	.32353	.4110	18.430	49033.8	51622.1	263.957	103.13	147.25
470.000	2.890	.34606	.3734	20.551	50301.0	53069.5	267.070	104.34	142.54
480.000	2.724	.36715	.3432	22.599	51540.7	54477.9	270.035	105.63	139.36
490.000	2.583	.38708	.3184	24.570	52763.6	55860.2	272.885	106.97	137.25
500.000	2.463	.40604	.2974	26.465	53977.1	57225.4	275.643	108.34	135.89
520.000	2.264	.44163	.2641	30.051	56395.4	59928.5	280.945	111.15	134.69
540.000	2.106	.47483	.2385	33.398	58822.6	62621.3	286.026	114.01	134.75
560.000	1.975	.50620	.2182	36.544	61273.9	65323.6	290.940	116.87	135.57
580.000	1.865	.53615	.2016	39.521	63758.2	68047.4	295.719	119.72	136.87
600.000	1.770	.56495	.1878	42.356	66280.8	70800.4	300.385	122.53	138.47
620.000	1.687	.59281	.1760	45.069	68845.0	73587.5	304.954	125.29	140.27
640.000	1.613	.61990	.1659	47.677	71452.7	76411.9	309.438	128.00	142.19
660.000	1.547	.64633	.1570	50.194	74105.0	79275.6	313.844	130.65	144.19
680.000	1.488	.67220	.1492	52.632	76802.3	82179.9	318.179	133.24	146.24
700.000	1.434	.69759	.1422	55.001	79544.6	85125.2	322.447	135.77	148.30



Table 30. Continued.

PROPANE ISOBAR AT P = 90 BAR

T	DEN	VOL	OP/OT	OP/DO	E	H	S	CV	CP
DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	M/SEC
86.304	16.658	.06003	35.9894	1634.275	5516.9	6057.2	82.717	59.26	83.91
90.000	16.576	.06033	34.5728	1569.455	5824.7	6367.6	86.239	59.14	84.08
100.000	16.356	.06114	31.1387	1412.412	6660.7	7210.9	95.122	58.92	84.58
110.000	16.135	.06198	28.1861	1277.317	7501.6	8059.4	103.208	58.84	85.12
120.000	15.915	.06284	25.6191	1159.631	8347.9	8913.4	110.637	58.87	85.69
130.000	15.694	.06372	23.3668	1055.986	9199.8	9773.3	117.520	59.02	86.31
140.000	15.472	.06463	21.3754	963.852	10058.1	10639.8	123.940	59.27	86.99
150.000	15.250	.06557	19.6028	881.275	10923.3	11513.4	129.967	59.62	87.74
160.000	15.027	.06655	18.0160	806.735	11796.0	12394.9	135.655	60.06	88.56
170.000	14.803	.06755	16.5881	739.010	12677.0	13285.0	141.051	60.58	89.47
180.000	14.578	.06860	15.2972	677.114	13567.2	14184.6	146.193	61.20	90.47
190.000	14.351	.06968	14.1249	620.242	14467.5	15094.7	151.113	61.89	91.57
200.000	14.122	.07081	13.0559	567.731	15379.0	16016.3	155.840	62.67	92.78
210.000	13.891	.07199	12.0771	519.031	16302.7	16950.6	160.398	63.53	94.11
220.000	13.657	.07322	11.1774	473.687	17239.9	17898.9	164.809	64.46	95.57
230.000	13.419	.07452	10.3469	431.323	18191.9	18862.6	169.093	65.48	97.18
240.000	13.177	.07589	9.5772	391.629	19168.5	19851.5	173.313	66.57	98.95
250.000	12.930	.07734	8.8609	354.351	20166.4	20862.5	177.453	67.74	100.88
260.000	12.676	.07889	8.1913	319.276	21184.3	21894.2	181.512	68.99	102.99
270.000	12.416	.08054	7.5627	286.246	22222.1	22947.0	185.436	70.32	105.31
280.000	12.148	.08232	6.9697	255.125	23280.5	24021.3	189.412	71.72	107.85
290.000	11.869	.08425	6.4077	225.812	24360.3	25118.6	193.270	73.19	110.62
300.000	11.579	.08636	5.8725	198.233	25463.4	26240.6	197.080	74.74	113.66
310.000	11.276	.08868	5.3603	172.336	26592.3	27390.5	200.855	76.35	117.00
320.000	10.956	.09127	4.8678	148.096	27750.7	28572.2	204.611	78.01	120.66
330.000	10.617	.09419	4.3923	125.508	28943.5	29791.2	208.366	79.71	124.70
340.000	10.255	.09751	3.9315	104.596	30176.4	31054.0	212.139	81.38	129.16
350.000	9.864	.10138	3.4840	85.408	31455.1	32367.6	215.950	82.92	134.05
360.000	9.436	.10597	3.0494	68.028	32785.1	33738.9	219.817	84.35	139.62
370.000	8.963	.11157	2.6287	52.572	34171.5	35175.6	223.737	86.95	147.48
380.000	8.431	.11861	2.2249	39.208	35629.4	36696.8	227.793	89.66	157.15
390.000	7.822	.12785	1.8436	28.177	37176.3	38326.9	232.027	92.40	169.29
400.000	7.118	.14049	1.4944	19.861	38824.9	40089.2	236.488	94.48	183.26
410.000	6.331	.15795	1.1928	14.809	40571.8	41993.3	241.189	98.03	196.30
420.000	5.552	.18011	.9572	13.093	42339.2	43960.2	245.929	99.29	194.64
430.000	4.892	.20440	.7885	13.429	44014.3	45854.0	250.385	100.40	183.58
440.000	4.371	.22879	.6682	14.526	45573.2	47632.3	254.474	101.45	172.24
450.000	3.963	.25232	.5801	16.123	47032.6	49303.5	258.230	102.52	162.31
460.000	3.642	.27454	.5138	17.985	48415.0	50885.9	261.709	103.65	154.54
470.000	3.385	.29541	.4625	19.945	49742.5	52401.2	264.968	104.85	148.83
480.000	3.174	.31506	.4216	21.917	51032.4	53867.9	268.056	106.11	144.75
490.000	2.997	.33365	.3882	23.862	52297.3	55300.1	271.009	107.42	141.87
500.000	2.846	.35133	.3605	25.762	53546.3	56708.3	273.854	108.76	139.89
520.000	2.601	.38446	.3168	29.403	56021.2	59481.3	279.293	111.52	137.76
540.000	2.408	.41525	.2839	32.836	58491.5	62228.7	284.477	114.33	137.18
560.000	2.251	.44424	.2581	36.079	60976.7	64974.9	289.471	117.16	137.55
580.000	2.119	.47182	.2372	39.156	63488.5	67734.8	294.313	119.97	138.52
600.000	2.007	.49826	.2199	42.088	66033.9	70518.2	299.031	122.75	139.87
620.000	1.909	.52377	.2054	44.894	68617.3	73331.2	303.643	125.49	141.47
640.000	1.823	.54850	.1929	47.590	71241.5	76178.0	308.162	128.18	143.24
660.000	1.746	.57258	.1821	50.191	73908.1	79061.3	312.598	130.82	145.11
680.000	1.678	.59610	.1726	52.707	76617.9	81982.9	316.959	133.39	147.05

DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
86.396	16.662	.06002	36.0613	1642.562	5517.9	6118.1	82.727	59.25	83.89	2296
90.000	16.583	.06030	34.6790	1579.200	5817.7	6420.7	86.159	59.14	84.06	2256
100.000	16.363	.06111	31.2394	1421.646	6652.7	7263.8	95.040	58.92	84.56	2150
110.000	16.143	.06195	28.2822	1286.143	7492.6	8112.0	103.123	58.84	85.09	2053
120.000	15.923	.06280	25.7115	1168.120	8337.7	8965.7	110.550	58.87	85.66	1963
130.000	15.703	.06368	23.4560	1064.194	9188.6	9825.4	117.430	59.02	86.28	1878
140.000	15.482	.06459	21.4617	971.826	10045.6	10691.5	123.848	59.27	86.95	1798
150.000	15.261	.06553	19.6869	889.062	10909.4	11564.7	129.872	59.62	87.70	1722
160.000	15.039	.06649	18.0979	814.346	11780.7	12445.6	135.557	60.06	88.51	1649
170.000	14.817	.06749	16.6682	746.482	12660.2	13335.1	140.949	60.59	89.41	1580
180.000	14.593	.06853	15.3758	684.471	13548.8	14234.1	146.087	61.20	90.40	1514
190.000	14.367	.06960	14.2022	627.505	14447.4	15143.4	151.003	61.90	91.48	1450
200.000	14.140	.07072	13.1322	574.920	15356.9	16064.1	155.725	62.67	92.68	1388
210.000	13.910	.07189	12.1526	526.165	16278.5	16997.4	160.278	63.53	94.00	1328
220.000	13.678	.07311	11.2523	480.784	17213.3	17944.4	164.683	64.47	95.44	1270
230.000	13.442	.07439	10.4216	438.401	18162.6	18906.6	168.960	65.49	97.02	1213
240.000	13.202	.07575	9.6521	398.704	19136.3	19893.8	173.173	66.58	98.75	1158
250.000	12.958	.07717	8.9362	361.439	20130.9	20902.6	177.304	67.75	100.65	1103
260.000	12.707	.07869	8.2675	326.397	21144.9	21931.9	181.353	69.00	102.72	1049
270.000	12.451	.08032	7.6402	293.415	22178.4	22981.6	185.326	70.33	104.98	996
280.000	12.186	.08206	7.0492	262.361	23231.7	24052.3	189.229	71.73	107.44	944
290.000	11.913	.08394	6.4898	233.135	24305.6	25145.1	193.071	73.21	110.12	891
300.000	11.629	.08599	5.9580	205.661	25401.6	26261.6	196.862	74.75	113.04	839
310.000	11.333	.08824	5.4502	179.890	26522.1	27404.5	200.615	76.37	116.22	787
320.000	11.022	.09073	4.9633	155.795	27670.2	28577.5	204.343	78.03	119.68	736
330.000	10.695	.09350	4.4948	133.371	28850.2	29785.3	208.063	79.72	123.43	684
340.000	10.347	.09665	4.0429	112.637	30067.0	31033.4	211.793	81.39	127.48	632
350.000	9.975	.10025	3.6063	93.631	31325.0	32327.5	215.548	82.93	131.78	580
360.000	9.575	.10444	3.1851	76.417	32627.6	33672.0	219.339	84.34	136.47	529
370.000	9.139	.10942	2.7803	61.078	33976.7	35070.9	223.156	86.90	142.96	477
380.000	8.662	.11545	2.3949	47.719	35382.3	36536.8	227.064	89.55	150.43	426
390.000	8.133	.12296	2.0332	36.464	36853.7	38083.3	231.081	92.19	159.04	377
400.000	7.544	.13255	1.7015	27.482	38394.0	39719.5	235.223	94.17	168.20	333
410.000	6.898	.14498	1.4077	21.014	40006.3	41456.1	239.511	97.66	178.92	295
420.000	6.221	.16074	1.1607	17.276	41666.8	43274.2	243.892	99.02	183.64	269
430.000	5.578	.17927	.9664	16.008	43310.6	45103.3	248.196	100.34	180.96	255
440.000	5.024	.19904	.8204	16.285	44887.4	46877.8	252.276	101.58	173.63	251
450.000	4.567	.21896	.7106	17.203	46886.3	48575.8	256.092	102.78	166.11	251
460.000	4.193	.23850	.6262	18.527	47817.4	50202.4	259.667	103.99	159.37	253
470.000	3.886	.25734	.5603	20.132	49193.6	51767.0	263.032	105.22	153.74	258
480.000	3.632	.27535	.5076	21.885	50527.9	53281.4	266.221	106.48	149.33	263
490.000	3.419	.29252	.4648	23.700	51832.0	54757.2	269.264	107.78	146.01	269
500.000	3.237	.30894	.4294	25.526	53115.1	56204.5	272.188	109.11	143.58	275
520.000	2.943	.33977	.3740	29.118	55645.7	59043.4	277.756	111.84	140.68	288
540.000	2.714	.36843	.3328	32.569	58159.0	61843.3	283.039	114.62	139.54	299
560.000	2.529	.39538	.3007	35.861	60678.4	64632.2	288.111	117.41	139.49	310
580.000	2.375	.42097	.2751	39.001	63217.9	67427.6	293.015	120.20	140.14	321
600.000	2.245	.44545	.2540	42.003	65786.3	70240.8	297.784	122.96	141.25	330
620.000	2.132	.46902	.2364	44.881	68389.2	73079.4	302.437	125.68	142.66	339
640.000	2.033	.49183	.2213	47.648	71030.0	75948.3	306.992	128.35	144.27	348
660.000	1.946	.51400	.2084	50.318	73711.0	78851.1	311.458	130.97	146.02	356
680.000	1.867	.53563	.1971	52.901	76433.4	81789.7	315.844	133.54	147.86	364
700.000	1.796	.55678	.1871	55.406	79198.0	84765.8	320.157	136.04	149.75	371



Table 30. Continued.

## PROPANE ISOBAR AT P = 110 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
86.489	16.666	.06000	36.1330	1650.847	5519.0	6179.1	82.738	59.25	83.88	2302
90.000	16.589	.06028	34.7850	1588.951	5810.8	6473.9	86.079	59.14	84.04	2262
100.000	16.370	.06109	31.3398	1430.885	6644.8	7316.7	94.958	58.92	84.54	2157
110.000	16.151	.06192	28.3782	1294.972	7483.6	8164.7	103.039	58.84	85.06	2060
120.000	15.932	.06277	25.8036	1176.609	8327.7	9018.1	110.464	58.88	85.63	1969
130.000	15.712	.06364	23.5449	1072.401	9177.4	9877.5	117.341	59.02	86.24	1885
140.000	15.493	.06455	21.5479	979.797	10033.2	10743.2	123.756	59.27	86.91	1805
150.000	15.272	.06548	19.7706	896.834	10895.7	11615.9	129.777	59.62	87.65	1729
160.000	15.052	.06644	18.1795	821.952	11765.6	12496.4	135.459	60.06	88.46	1656
170.000	14.830	.06743	16.7481	753.947	12643.6	13385.4	140.848	60.59	89.35	1587
180.000	14.607	.06846	15.4540	691.819	13530.6	14283.7	145.982	61.20	90.33	1521
190.000	14.383	.06953	14.2792	634.758	14427.4	15192.2	150.893	61.90	91.40	1457
200.000	14.157	.07064	13.2081	582.097	15335.0	16112.0	155.611	62.68	92.58	1396
210.000	13.929	.07179	12.2277	533.284	16254.6	17044.3	160.159	63.54	93.88	1336
220.000	13.698	.07300	11.3268	487.863	17187.1	17990.1	164.559	64.48	95.31	1278
230.000	13.465	.07427	10.4958	445.457	18133.9	18950.8	168.829	65.49	96.87	1222
240.000	13.227	.07560	9.7263	405.753	19104.7	19936.3	173.036	66.59	98.57	1167
250.000	12.985	.07701	9.0108	368.497	20096.1	20943.2	177.158	67.76	100.43	1112
260.000	12.738	.07851	8.3428	333.480	21106.5	21970.1	181.198	69.01	102.46	1059
270.000	12.484	.08010	7.7168	300.539	22135.8	23016.9	185.160	70.34	104.66	1007
280.000	12.224	.08181	7.1274	269.543	23184.2	24084.1	189.050	71.74	107.06	955
290.000	11.955	.08365	6.5704	240.390	24252.6	25172.7	192.878	73.22	109.66	903
300.000	11.677	.08564	6.0416	213.007	25342.0	26284.1	196.651	74.77	112.47	852
310.000	11.387	.08782	5.5377	187.343	26454.6	27420.6	200.383	76.38	115.52	801
320.000	11.085	.09021	5.0558	163.370	27593.4	28585.7	204.086	78.05	118.80	750
330.000	10.768	.09287	4.5934	141.082	28762.0	29783.5	207.776	79.74	122.31	700
340.000	10.433	.09585	4.1489	120.489	29964.6	31019.0	211.467	81.41	126.04	650
350.000	10.078	.09923	3.7214	101.623	31205.0	32296.5	215.174	82.93	129.90	600
360.000	9.699	.10310	3.3108	84.530	32485.1	33619.2	218.904	84.33	133.96	551
370.000	9.293	.10761	2.9184	69.267	33805.1	34988.8	222.640	86.87	139.55	502
380.000	8.855	.11293	2.5464	55.897	35172.2	36414.4	226.442	89.48	145.70	454
390.000	8.380	.11933	2.1985	44.481	36592.1	37904.6	230.313	92.06	152.40	408
400.000	7.866	.12714	1.8791	35.087	38063.8	39462.3	234.256	93.97	159.03	366
410.000	7.311	.13679	1.5929	27.801	39589.8	41044.5	238.286	97.40	167.41	329
420.000	6.726	.14868	1.3446	22.739	41160.7	42796.2	242.386	98.75	172.58	300
430.000	6.141	.16285	1.1379	19.903	42743.2	44534.5	246.476	100.16	174.34	280
440.000	5.596	.17871	.9729	18.946	44302.3	46288.1	250.462	101.53	171.74	269
450.000	5.119	.19536	.8443	19.194	45811.9	47960.8	254.266	102.85	166.63	265
460.000	4.714	.21214	.7438	20.013	47266.9	49600.4	257.870	104.15	161.37	265
470.000	4.372	.22873	.6639	21.156	48674.1	51190.0	261.289	105.44	156.67	266
480.000	4.083	.24492	.5995	22.560	50041.7	52735.8	264.544	106.74	152.61	270
490.000	3.838	.26058	.5469	24.133	51378.3	54244.7	267.655	108.05	149.29	274
500.000	3.627	.27569	.5033	25.798	52691.4	55724.0	270.644	109.39	146.70	280
520.000	3.286	.30428	.4353	29.219	55273.6	58620.7	276.325	112.11	143.33	291
540.000	3.021	.33098	.3849	32.611	57828.3	61469.1	281.700	114.87	141.75	302
560.000	2.808	.35611	.3461	35.900	60381.1	64298.3	286.845	117.64	141.34	312
580.000	2.632	.37997	.3152	39.066	62948.0	67127.6	291.809	120.41	141.70	322
600.000	2.483	.40277	.2899	42.110	65539.2	69959.7	296.626	123.15	142.58	332
620.000	2.355	.42470	.2689	45.037	68161.4	72833.1	301.321	125.85	143.81	341
640.000	2.243	.44590	.2511	47.858	70818.9	75723.7	305.909	128.51	145.28	350
660.000	2.144	.46647	.2358	50.582	73514.3	78425.4	310.454	131.18	146.78	359

T	DEG K	DEN	VOL	DP/DT	DP/DO	E	H	S	CV	CP	M
		MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
86.561	16.670	16.670	.05999	36.2043	1659.131	5520.1	6240.0	82.749	59.25	83.86	2307
90.000	16.595	16.595	.06026	34.8907	1598.709	5803.9	6527.0	86.000	59.14	84.03	2269
100.000	16.377	16.377	.06106	31.4400	1440.127	6636.9	7369.7	94.877	58.92	84.52	2164
110.000	16.159	16.159	.06189	28.4739	1303.802	7474.8	8217.4	102.955	58.84	85.04	2067
120.000	15.940	15.940	.06273	25.8955	1185.099	8317.7	9070.5	110.377	58.88	85.60	1976
130.000	15.722	15.722	.06361	23.6335	1080.608	9166.3	9929.5	117.252	59.02	86.21	1891
140.000	15.503	15.503	.06450	21.6337	987.766	10020.9	10794.9	123.665	59.28	86.88	1811
150.000	15.284	15.284	.06543	19.8540	904.602	10882.1	11667.3	129.683	59.62	87.61	1736
160.000	15.064	15.064	.06638	18.2609	829.553	11750.7	12547.3	135.362	60.06	88.41	1664
170.000	14.843	14.843	.06737	16.8276	761.406	12627.2	13435.7	140.747	60.59	89.29	1595
180.000	14.622	14.622	.06839	15.5320	699.160	13512.6	14333.3	145.877	61.21	90.26	1529
190.000	14.399	14.399	.06945	14.3558	642.001	14407.7	15241.1	150.785	61.90	91.32	1465
200.000	14.174	14.174	.07055	13.2836	589.262	15313.5	16160.1	155.499	62.68	92.49	1404
210.000	13.948	13.948	.07170	12.3023	540.389	16231.0	17091.3	160.042	63.54	93.77	1344
220.000	13.719	13.719	.07289	11.4009	494.925	17161.3	18036.0	164.436	64.48	95.18	1287
230.000	13.487	13.487	.07415	10.5695	452.492	18105.6	18995.3	168.700	65.50	96.72	1230
240.000	13.251	13.251	.07546	9.7999	412.777	19073.6	19979.2	172.899	66.60	98.39	1176
250.000	13.012	13.012	.07685	9.0847	375.526	20061.9	20984.1	177.014	67.77	100.22	1122
260.000	12.767	12.767	.07832	8.4174	340.531	21068.8	22008.7	181.045	69.02	102.21	1069
270.000	12.517	12.517	.07989	7.7924	307.622	22094.1	23052.8	184.996	70.35	104.37	1017
280.000	12.260	12.260	.08156	7.2046	276.674	23138.0	24116.8	188.875	71.76	106.70	965
290.000	11.996	11.996	.08336	6.6496	247.584	24201.1	25201.4	192.689	73.24	109.23	915
300.000	11.723	11.723	.08530	6.1236	220.278	25284.3	26308.0	196.446	74.79	111.95	864
310.000	11.440	11.440	.08742	5.6231	194.704	26389.7	27438.7	200.159	76.40	114.87	814
320.000	11.145	11.145	.08973	5.1455	170.834	27519.8	28596.6	203.839	78.07	118.00	765
330.000	10.837	10.837	.09228	4.6885	148.656	28678.1	29785.5	211.159	79.76	121.31	716
340.000	10.513	10.513	.09512	4.2504	128.177	29868.3	31009.7	214.825	81.42	124.78	667
350.000	10.173	10.173	.09830	3.8304	109.419	31093.4	32273.1	218.504	82.94	128.30	619
360.000	9.812	9.812	.10191	3.4286	92.414	32354.6	33577.6	222.176	84.33	131.90	572
370.000	9.430	9.430	.10605	3.0459	77.198	33651.0	34923.6	225.895	86.95	136.86	525
380.000	9.022	9.022	.11084	2.6844	63.805	34988.2	36318.3	229.659	89.43	142.15	479
390.000	8.588	8.588	.11645	2.3467	52.260	36370.2	37767.6	233.465	91.98	147.71	436
400.000	8.124	8.124	.12309	2.0363	42.572	37794.0	39271.1	237.323	93.83	152.87	396
410.000	7.632	7.632	.13103	1.7563	34.754	39261.3	40833.7	241.226	97.21	159.69	359
420.000	7.116	7.116	.14053	1.5095	28.835	40766.8	42453.2	245.126	98.54	164.08	329
430.000	6.591	6.591	.15172	1.2976	24.830	42290.0	44110.7	248.977	99.96	167.08	306
440.000	6.080	6.080	.16448	1.1210	22.634	43812.2	45786.0	252.720	101.40	167.49	291
450.000	5.608	5.608	.17832	.9777	21.903	45311.6	47451.5	256.314	102.81	165.26	282
460.000	5.190	5.190	.19269	.8628	22.144	46774.1	49086.4	259.748	104.19	161.60	279
470.000	4.827	4.827	.20716	.7703	22.899	48197.2	50683.1	266.188	105.54	157.81	278
480.000	4.514	4.514	.22151	.6950	23.924	49585.8	52244.0	269.223	106.89	154.44	279
490.000	4.244	4.244	.23563	.6329	25.178	50945.9	53773.4	274.996	108.24	151.51	282
500.000	4.010	4.010	.24940	.5810	26.601	52283.0	55275.8	280.451	109.59	149.06	286
520.000	3.626	3.626	.27578	.5000	29.724	54909.8	58219.1	285.663	112.32	145.59	295
540.000	3.327	3.327	.30061	.4400	32.973	57502.5	61109.9	288.451	115.08	143.73	305
560.000	3.086	3.086	.32408	.3939	36.203	60087.0	63976.0	290.682	117.84	143.04	315
580.000	2.887	2.887	.34639	.3573	39.356	62680.4	66837.0	295.546	120.59	143.17	325
600.000	2.720	2.720	.36771	.3276	42.411	65293.9	69706.4	298.875	123.32	143.85	334
620.000	2.576	2.576	.38821	.3030	45.364	67935.0	72593.6	300.280	126.01	144.92	343
640.000	2.451	2.451	.40801	.2822	48.220	70608.8	75505.0	304.901	128.66	146.26	352
660.000	2.341	2.341	.42722	.2644	50.984	73318.4	78445.0	309.425	131.26	147.78	360
680.000	2.243	2.243	.44590	.2490	53.663	76066.0	81416.9	313.860	133.80	149.42	368
700.000	2.155	2.155	.46414	.2355	56.264	78852.8	84422.5	318.217	136.29	151.15	376



Table 30. Continued.

PROPANE ISOBAR AT P = 130 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
86.674	16.674	.05997	36.2754	1667.414	5521.3	6300.9	82.760	59.25	83.85	2313
90.000	16.602	.06024	34.9962	1608.472	5797.0	6580.1	85.920	59.14	84.01	2276
100.000	16.384	.06104	31.5400	1449.375	6629.1	7422.6	94.795	58.93	84.49	2170
110.000	16.166	.06186	28.5693	1312.634	7465.9	8270.1	102.872	58.84	85.01	2073
120.000	15.949	.06270	25.9871	1193.589	8307.9	9123.0	110.292	58.88	85.57	1983
130.000	15.731	.06357	23.7219	1088.814	9155.3	9981.7	117.164	59.03	86.18	1898
140.000	15.513	.06446	21.7193	995.733	10008.7	10846.7	123.574	59.28	86.84	1818
150.000	15.295	.06538	19.9372	912.367	10868.6	11718.6	129.589	59.63	87.56	1743
160.000	15.076	.06631	18.3419	837.149	11735.8	12598.2	135.265	60.07	88.36	1671
170.000	14.856	.06731	16.9068	768.859	12611.0	13486.0	140.647	60.59	89.23	1602
180.000	14.636	.06833	15.6096	706.493	13494.8	14383.0	145.774	61.21	90.19	1536
190.000	14.414	.06938	14.4320	649.235	14388.2	15290.1	150.678	61.91	91.24	1473
200.000	14.191	.07047	13.3587	596.416	15292.2	16208.3	155.387	62.69	92.40	1411
210.000	13.966	.07160	12.3766	547.481	16207.7	17138.5	159.925	63.55	93.67	1352
220.000	13.739	.07279	11.4745	501.971	17135.8	18082.0	164.314	64.49	95.06	1295
230.000	13.509	.07403	10.6427	459.508	18077.7	19040.1	168.573	65.51	96.57	1239
240.000	13.275	.07533	9.8730	419.778	19043.1	20022.4	172.765	66.60	98.22	1184
250.000	13.038	.07670	9.1580	382.527	20028.4	21025.5	176.873	67.78	100.02	1131
260.000	12.796	.07815	8.4912	347.545	21031.9	22047.8	180.895	69.03	101.97	1078
270.000	12.549	.07969	7.8671	314.664	22053.5	23089.4	184.836	70.36	104.08	1027
280.000	12.296	.08133	7.2807	283.757	23093.0	24150.2	188.704	71.77	106.36	976
290.000	12.036	.08309	6.7275	254.720	24151.0	25233.1	192.504	73.25	108.82	926
300.000	11.768	.08498	6.2039	227.479	25228.5	26333.3	196.247	74.80	111.46	876
310.000	11.490	.08703	5.7066	201.982	26327.1	27458.6	199.941	76.42	114.28	827
320.000	11.202	.08927	5.2328	178.197	27449.4	28609.9	203.601	78.09	117.27	779
330.000	10.902	.09172	4.7804	156.110	28598.3	29790.7	207.238	79.78	120.42	731
340.000	10.589	.09444	4.3478	135.722	29777.3	31005.0	210.867	81.44	123.67	683
350.000	10.261	.09746	3.9343	117.046	30989.0	32256.0	214.497	82.96	126.92	637
360.000	9.916	.10084	3.5398	100.103	32234.0	33545.0	218.132	84.34	130.16	591
370.000	9.553	.10468	3.1651	84.913	33510.7	34871.5	221.750	86.84	134.67	546
380.000	9.170	.10905	2.8118	71.490	34823.9	36241.5	225.403	89.40	139.38	502
390.000	8.766	.11407	2.4821	59.831	36176.5	37659.4	229.086	91.92	144.18	461
400.000	8.341	.11990	2.1786	49.916	37564.5	39123.2	232.792	93.74	148.41	423
410.000	7.894	.12668	1.9035	41.715	38989.4	40636.2	236.528	97.08	154.23	387
420.000	7.430	.13460	1.6586	35.204	40446.9	42196.7	240.288	98.38	157.83	357
430.000	6.955	.14378	1.4446	30.369	41921.9	43791.0	244.039	99.79	160.87	333
440.000	6.484	.15424	1.2614	27.164	43404.6	45409.6	247.760	101.26	162.57	314
450.000	6.032	.16578	1.1079	25.435	44881.0	47036.1	251.415	102.72	162.40	301
460.000	5.617	.17805	.9813	24.880	46337.5	48652.1	254.967	104.15	160.59	294
470.000	5.245	.19067	.8775	25.125	47766.4	50245.0	258.393	105.57	157.93	291
480.000	4.917	.20337	.7920	25.833	49166.6	51810.4	261.689	106.96	155.17	291
490.000	4.630	.21600	.7210	26.781	50541.6	53349.5	264.863	108.35	152.72	292
500.000	4.377	.22846	.6613	27.926	51895.8	54865.8	267.926	109.73	150.60	294
520.000	3.958	.25266	.5674	30.644	54558.5	57843.1	273.755	112.48	147.36	301
540.000	3.627	.27572	.4975	33.664	57184.6	60769.0	279.286	115.25	145.43	310
560.000	3.360	.29763	.4438	36.774	59798.2	63667.4	284.557	118.01	144.58	319
580.000	3.140	.31852	.4013	39.871	62416.5	66557.3	289.628	120.75	144.52	328
600.000	2.954	.33852	.3669	42.906	65051.4	69452.2	294.535	123.47	145.04	338
620.000	2.795	.35776	.3384	45.863	67710.9	72361.7	299.305	126.15	145.97	346
640.000	2.657	.37633	.3145	48.735	70400.6	75292.9	303.958	128.79	147.19	355
660.000	2.536	.39434	.2941	51.524	73124.1	78250.5	308.508	131.38	148.61	363

DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
86.766	16.678	.05996	36.3463	1675.696	5522.4	6361.9	82.771	59.25	83.84	2318
90.000	16.608	.06021	35.1015	1618.242	5790.3	6633.2	85.842	59.14	83.99	2282
100.000	16.391	.06101	31.6398	1458.626	6621.4	7475.5	94.714	58.93	84.47	2177
110.000	16.174	.06183	28.6645	1321.469	7457.2	8322.8	102.788	58.84	84.99	2080
120.000	15.957	.06267	26.0785	1202.080	8298.0	9175.4	110.206	58.88	85.54	1990
130.000	15.740	.06353	23.8100	1097.019	9144.3	10033.8	117.076	59.03	86.14	1905
140.000	15.523	.06442	21.8046	1003.698	9996.6	10898.5	123.483	59.28	86.80	1825
150.000	15.305	.06534	20.0200	920.129	10855.3	11770.0	129.496	59.63	87.52	1750
160.000	15.088	.06628	18.4226	844.740	11721.2	12649.1	135.169	60.07	88.31	1678
170.000	14.869	.06725	16.9856	776.306	12594.9	13536.4	140.548	60.60	89.17	1609
180.000	14.650	.06826	15.6868	713.818	13477.2	14432.8	145.671	61.21	90.13	1543
190.000	14.430	.06930	14.5079	656.459	14369.0	15339.2	150.571	61.91	91.17	1480
200.000	14.208	.07038	13.4334	603.558	15271.2	16256.5	155.276	62.69	92.31	1419
210.000	13.984	.07151	12.4504	554.559	16184.7	17185.8	159.810	63.55	93.57	1360
220.000	13.759	.07268	11.5476	509.001	17110.7	18128.3	164.194	64.49	94.94	1303
230.000	13.530	.07391	10.7154	466.505	18050.3	19085.0	168.446	65.51	96.43	1247
240.000	13.299	.07519	9.9455	426.757	19013.1	20065.8	172.633	66.61	98.06	1193
250.000	13.064	.07655	9.2306	389.501	19995.5	21067.1	176.733	67.79	99.83	1140
260.000	12.825	.07797	8.5643	354.528	20995.8	22087.4	180.746	69.04	101.74	1088
270.000	12.581	.07949	7.9410	321.668	22013.7	23126.5	184.679	70.37	103.81	1037
280.000	12.331	.08110	7.3557	290.794	23049.0	24184.4	188.536	71.78	106.04	987
290.000	12.075	.08282	6.8043	261.802	24102.3	25261.8	192.324	73.26	108.44	937
300.000	11.811	.08467	6.2828	234.617	25174.4	26359.7	196.052	74.82	111.00	888
310.000	11.539	.08667	5.7883	209.184	26266.7	27480.0	199.731	76.43	113.73	840
320.000	11.257	.08883	5.3178	185.469	27381.6	28625.3	203.371	78.10	116.61	792
330.000	10.965	.09120	4.8695	163.455	28522.0	29798.8	206.985	79.80	119.61	745
340.000	10.661	.09380	4.4418	143.138	29690.9	31004.1	210.587	81.46	122.69	699
350.000	10.344	.09668	4.0338	124.524	30890.8	32244.2	214.186	82.97	125.71	654
360.000	10.013	.09987	3.6454	107.624	32121.7	33519.9	217.783	84.34	128.69	610
370.000	9.666	.10346	3.2773	92.444	33381.6	34830.0	221.357	86.84	132.85	566
380.000	9.303	.10749	2.9307	78.984	34674.8	36179.7	224.956	89.39	137.13	524
390.000	8.924	.11206	2.6074	67.222	36003.8	37572.6	228.574	91.88	141.41	484
400.000	8.528	.11727	2.3093	57.120	37364.0	39005.8	232.202	93.67	145.03	447
410.000	8.116	.12322	2.0382	48.622	38756.5	40481.6	235.846	96.98	150.17	413
420.000	7.690	.13003	1.7950	41.675	40177.8	41998.2	239.500	98.26	153.16	383
430.000	7.256	.13781	1.5802	36.234	41614.7	43544.0	243.138	99.66	155.93	358
440.000	6.821	.14660	1.3932	32.258	43062.2	45114.6	246.748	101.12	158.02	338
450.000	6.397	.15633	1.2329	29.666	44511.9	46700.6	250.312	102.61	158.96	322
460.000	5.994	.16683	1.0975	28.289	45953.7	48289.4	253.804	104.08	158.60	312
470.000	5.623	.17784	.9841	27.872	47379.3	49869.0	257.202	105.54	157.19	306
480.000	5.288	.18909	.8894	28.128	48784.1	51431.4	260.491	106.98	155.25	304
490.000	4.990	.20040	.8101	28.801	50168.1	52973.7	263.671	108.40	153.24	303
500.000	4.725	.21166	.7430	29.699	51533.6	54496.8	266.749	109.81	151.44	304
520.000	4.278	.23378	.6367	31.971	54223.1	57495.9	272.630	112.60	148.63	309
540.000	3.920	.25512	.5570	34.688	56877.1	60448.8	278.203	115.39	146.81	316
560.000	3.629	.27557	.4955	37.618	59516.6	63374.6	283.523	118.15	145.91	324
580.000	3.388	.29515	.4469	40.613	62157.9	66289.9	288.638	120.90	145.74	333
600.000	3.185	.31394	.4076	43.596	64812.8	69208.0	293.584	123.61	146.14	341
620.000	3.012	.33203	.3751	46.531	67489.8	72138.3	298.389	126.28	146.95	350
640.000	2.861	.34952	.3479	49.401	70194.8	75088.1	303.071	128.91	148.07	358
660.000	2.729	.36647	.3247	52.200	72931.8	78062.4	307.647	131.50	149.40	366
680.000	2.611	.38295	.3047	54.926	75703.6	81064.9	312.129	134.02	150.88	374
700.000	2.506	.39903	.2873	57.582	78511.9	84098.2	316.525	136.50	152.47	381



Table 30. Continued.

## PROPANE ISOBAR AT P = 160 BAR

T	DEN	VOL	DP/DT	BAR-L/MOL	DP/DO	E	H	S	CV	CP	W
DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	DP/DO	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
86.951	16.686	.05993	36.4871	1692.257	5524.8	6483.7	82.794	59.24	83.81	2330	
90.000	16.620	.06017	35.3114	1637.801	5776.8	6739.5	85.685	59.15	83.95	2296	
100.000	16.404	.06096	31.8386	1477.143	6606.1	7581.4	94.554	53.93	84.43	2190	
110.000	16.189	.06177	28.8543	1339.146	7439.9	8428.2	102.623	58.85	84.94	2093	
120.000	15.973	.06260	26.2606	1219.065	8278.7	9280.3	110.037	58.88	85.49	2003	
130.000	15.758	.06346	23.9855	1113.428	9122.8	10138.1	116.902	59.03	86.08	1918	
140.000	15.543	.06434	21.9745	1019.623	9972.7	11002.1	123.304	59.28	86.73	1839	
150.000	15.327	.06524	20.1850	935.645	10829.0	11872.9	129.311	59.63	87.44	1763	
160.000	15.111	.06618	18.5833	859.910	11692.2	12751.1	134.978	60.07	88.21	1692	
170.000	14.895	.06714	17.1425	791.182	12563.2	13637.4	140.351	60.60	89.06	1623	
180.000	14.678	.06813	15.8405	728.447	13442.5	14532.6	145.468	61.22	90.00	1558	
190.000	14.460	.06916	14.6587	670.882	14331.1	15437.6	150.351	61.92	91.02	1495	
200.000	14.241	.07022	13.5819	617.811	15229.9	16353.4	155.057	62.70	92.15	1434	
210.000	14.020	.07133	12.5969	568.677	16139.7	17280.9	159.582	63.56	93.37	1376	
220.000	13.797	.07248	11.6926	523.016	17061.6	18221.2	163.956	64.50	94.71	1319	
230.000	13.573	.07368	10.8594	480.445	17996.7	19175.5	168.198	65.52	96.17	1264	
240.000	13.345	.07493	10.0890	440.651	18954.5	20153.5	172.372	66.62	97.75	1210	
250.000	13.115	.07625	9.3741	403.374	19931.4	21151.4	176.459	67.80	99.47	1158	
260.000	12.880	.07764	8.7084	368.404	20925.6	22167.8	180.457	69.06	101.32	1107	
270.000	12.642	.07910	8.0863	335.573	21936.6	23202.2	184.372	70.39	103.31	1056	
280.000	12.398	.08066	7.5031	304.745	22964.2	24254.7	188.209	71.80	105.45	1007	
290.000	12.149	.08231	6.9544	275.819	24008.8	25325.7	191.975	73.29	107.74	958	
300.000	11.894	.08408	6.4366	248.716	25070.8	26416.1	195.677	74.85	110.17	911	
310.000	11.631	.08598	5.9467	223.379	26151.7	27527.3	199.326	76.46	112.74	864	
320.000	11.361	.08802	5.4820	199.768	27253.5	28661.8	202.932	78.14	115.43	818	
330.000	11.082	.09024	5.0404	177.860	28378.7	29822.5	206.507	79.83	118.21	772	
340.000	10.794	.09265	4.6206	157.641	29530.1	31012.5	210.063	81.49	121.01	728	
350.000	10.496	.09528	4.2215	139.104	30709.7	32234.1	213.609	83.00	123.70	685	
360.000	10.187	.09817	3.8430	122.243	31917.1	33487.8	217.144	84.36	126.28	644	
370.000	9.867	.10135	3.4852	107.049	33149.9	34771.5	220.645	86.85	129.97	602	
380.000	9.536	.10487	3.1488	93.497	34411.7	36089.6	224.160	89.37	133.69	563	
390.000	9.193	.10877	2.8350	81.548	35704.6	37445.0	227.681	91.84	137.32	525	
400.000	8.841	.11312	2.5450	71.140	37023.6	38833.5	231.196	93.59	140.19	491	
410.000	8.478	.11795	2.2796	62.195	38369.7	40256.9	234.710	96.86	144.52	458	
420.000	8.108	.12333	2.0392	54.630	39739.7	41713.0	238.219	98.09	146.72	430	
430.000	7.733	.12932	1.8239	48.364	41122.2	43191.3	241.698	99.46	148.92	405	
440.000	7.355	.13596	1.6327	43.333	42515.6	44690.9	245.145	100.91	150.95	383	
450.000	6.981	.14325	1.4645	39.480	43917.0	46208.9	248.556	102.41	152.58	365	
460.000	6.616	.15116	1.3179	36.735	45321.9	47740.4	251.922	103.92	153.61	350	
470.000	6.266	.15960	1.1910	34.995	46725.2	49278.8	255.231	105.43	153.95	340	
480.000	5.936	.16845	1.0817	34.110	48122.1	50817.3	258.470	106.92	153.65	333	
490.000	5.632	.17755	.9880	33.902	49509.3	52350.2	261.631	108.40	152.88	329	
500.000	5.354	.18679	.9076	34.190	50885.5	53874.1	264.709	109.86	151.88	327	
520.000	4.871	.20528	.7781	35.650	53607.3	56891.7	270.627	112.74	149.95	327	
540.000	4.474	.22350	.6797	37.689	56300.5	59876.5	276.260	115.57	148.63	331	
560.000	4.145	.24126	.6030	40.116	58980.6	62840.9	281.650	118.36	147.90	337	
580.000	3.869	.25848	.5420	42.780	61660.6	65796.2	286.836	121.11	147.72	343	
600.000	3.635	.27513	.4925	45.558	64350.9	68752.9	291.847	123.83	148.01	351	
620.000	3.434	.29123	.4517	48.372	67059.6	71719.2	296.711	126.50	148.68	359	
640.000	3.259	.30682	.4175	51.177	69792.9	74702.1	301.446	129.12	149.65	366	
660.000	3.106	.32196	.3885	53.947	72555.2	77706.6	306.068	131.70	150.84	374	
680.000	2.970	.33670	.3636	56.694	75380.2	80661.9	310.691	134.28	152.06	382	

DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	H/SEC
87.136	16.694	.05990	36.6269	1708.815	5527.4	6605.6	82.818	59.24	83.78	2341
90.000	16.632	.06012	35.5204	1657.385	5763.6	6845.8	85.529	59.15	83.92	2309
100.000	16.418	.06091	32.0365	1495.678	6591.0	7687.3	94.394	58.93	84.39	2203
110.000	16.204	.06171	29.0431	1356.833	7422.8	8533.7	102.460	58.85	84.89	2106
120.000	15.990	.06254	26.4417	1236.054	8259.6	9385.3	109.869	58.89	85.43	2016
130.000	15.776	.06339	24.1601	1129.836	9101.5	10242.5	116.729	59.03	86.02	1932
140.000	15.562	.06426	22.1433	1035.542	9949.2	11105.9	123.127	59.29	86.66	1852
150.000	15.348	.06515	20.3488	951.149	10803.1	11975.9	129.128	59.64	87.36	1777
160.000	15.134	.06608	18.7429	875.073	11663.8	12853.2	134.790	60.08	88.12	1706
170.000	14.920	.06703	17.2983	806.037	12532.1	13738.6	140.157	60.61	88.96	1637
180.000	14.705	.06800	15.9929	743.049	13408.6	14632.7	145.267	61.23	89.88	1572
190.000	14.489	.06902	14.8082	685.271	14294.1	15536.4	150.153	61.93	90.89	1510
200.000	14.273	.07006	13.7289	632.025	15189.5	16450.7	154.842	62.71	91.99	1449
210.000	14.055	.07115	12.7419	582.747	16095.8	17376.5	159.359	63.57	93.19	1391
220.000	13.835	.07228	11.8360	536.973	17013.8	18314.8	163.724	64.51	94.50	1335
230.000	13.614	.07346	11.0016	494.318	17944.6	19266.8	167.955	65.54	95.92	1280
240.000	13.390	.07468	10.2305	454.465	18897.8	20242.1	172.118	66.64	97.47	1227
250.000	13.163	.07597	9.5153	417.153	19869.5	21237.0	176.192	67.82	99.13	1175
260.000	12.934	.07732	8.8499	382.170	20858.0	22249.7	180.176	69.08	100.93	1125
270.000	12.700	.07874	8.2287	349.346	21862.6	23280.0	184.075	70.41	102.86	1075
280.000	12.462	.08024	7.6470	318.545	22883.2	24327.5	187.895	71.83	104.92	1027
290.000	12.220	.08183	7.1005	289.658	23919.7	25392.8	191.640	73.31	107.12	979
300.000	11.972	.08353	6.5856	262.607	24972.8	26476.3	195.320	74.87	109.44	932
310.000	11.718	.08534	6.0994	237.330	26043.6	27579.7	198.942	76.49	111.88	887
320.000	11.458	.08728	5.6392	213.784	27133.9	28704.9	202.519	78.17	114.43	842
330.000	11.190	.08936	5.2030	191.938	28246.1	29854.6	206.061	79.86	117.03	798
340.000	10.915	.09161	4.7893	171.770	29362.7	31031.8	209.578	81.52	119.63	756
350.000	10.632	.09405	4.3971	153.263	30545.5	32238.5	213.080	83.03	122.08	714
360.000	10.341	.09670	4.0258	136.400	31734.0	33474.6	216.566	84.39	124.39	675
370.000	10.042	.09958	3.6756	121.158	32945.4	34737.9	220.011	86.86	127.77	635
380.000	9.735	.10272	3.3467	107.500	34183.3	36032.4	223.463	89.37	131.15	598
390.000	9.420	.10616	3.0396	95.376	35449.6	37360.5	226.913	91.82	134.40	562
400.000	9.098	.10992	2.7551	84.713	36739.2	38717.7	230.349	93.55	136.86	530
410.000	8.770	.11403	2.4936	75.427	38053.1	40105.6	233.776	96.80	140.74	498
420.000	8.437	.11853	2.2553	67.421	39388.3	41521.8	237.188	98.00	142.51	471
430.000	8.101	.12344	2.0397	60.603	40734.1	42955.9	240.563	99.34	144.32	446
440.000	7.765	.12879	1.8462	54.888	42089.9	44408.1	243.901	100.78	146.09	424
450.000	7.430	.13460	1.6735	50.210	43454.6	45877.4	247.203	102.26	147.73	405
460.000	7.099	.14086	1.5202	46.511	44826.4	47361.9	250.466	103.78	149.13	389
470.000	6.777	.14756	1.3849	43.729	46202.8	48858.8	253.685	105.30	150.18	376
480.000	6.467	.15463	1.2659	41.792	47580.8	50364.2	256.855	106.82	150.83	365
490.000	6.172	.16202	1.1616	40.601	48957.8	51874.1	259.968	108.33	151.08	358
500.000	5.895	.16962	1.0703	40.039	50331.4	53384.7	263.020	109.83	150.99	353
520.000	5.400	.18519	.9205	40.306	53064.5	56398.0	268.929	112.78	150.27	348
540.000	4.979	.20083	.8048	41.698	55780.2	59395.1	274.585	115.66	149.49	349
560.000	4.624	.21628	.7137	43.603	58487.1	62380.0	280.013	118.49	149.08	352
580.000	4.321	.23142	.6406	45.829	61195.4	65361.0	285.243	121.26	149.08	357
600.000	4.062	.24621	.5810	48.285	63913.7	68345.4	290.302	123.99	149.42	363
620.000	3.837	.26060	.5317	50.876	66649.1	71339.8	295.211	126.67	150.07	369
640.000	3.642	.27460	.4904	53.533	69407.0	74349.8	299.989	129.29	150.97	376
660.000	3.469	.28824	.4553	56.211	72191.7	77380.0	304.651	131.86	152.08	383
680.000	3.316	.30153	.4251	58.879	75006.5	80434.0	309.210	134.38	153.35	390
700.000	3.180	.31450	.3989	61.521	77853.8	83514.8	313.675	136.83	154.74	397



Table 30. Continued.

PROPANE ISOBAR AT P = 200 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DO BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
87.320	16.701	.05988	36.7657	1725.371	5530.0	6727.5	82.842	59.23	83.76	2352
90.000	16.644	.06008	35.7286	1676.998	5750.5	6952.1	85.375	59.15	83.88	2322
100.000	16.431	.06086	32.2336	1514.231	6576.1	7793.3	94.236	58.93	84.35	2216
110.000	16.218	.06166	29.2310	1374.531	7406.0	8639.2	102.297	58.85	84.85	2119
120.000	16.006	.06248	26.6219	1253.049	8240.8	9490.3	109.702	58.89	85.38	2029
130.000	15.793	.06332	24.3337	1146.243	9080.6	10347.0	116.558	59.04	85.96	1945
140.000	15.581	.06418	22.3112	1051.455	9926.1	11209.7	122.951	59.29	86.59	1866
150.000	15.369	.06507	20.5117	966.643	10777.7	12079.0	128.948	59.64	87.28	1791
160.000	15.157	.06598	18.9014	890.212	11636.0	12955.5	134.604	60.08	88.03	1719
170.000	14.944	.06691	17.4529	820.870	12501.6	13839.9	139.965	60.61	88.86	1651
180.000	14.732	.06788	16.1441	757.625	13375.3	14733.0	145.070	61.23	89.76	1587
190.000	14.518	.06888	14.9565	699.630	14257.9	15635.5	149.949	61.93	90.75	1524
200.000	14.304	.06991	13.8747	646.200	15150.1	16548.3	154.631	62.72	91.84	1464
210.000	14.089	.07098	12.8855	596.772	16052.9	17472.5	159.140	63.58	93.02	1407
220.000	13.872	.07209	11.9778	550.878	16967.2	18409.0	163.496	64.52	94.30	1351
230.000	13.654	.07324	11.1421	508.129	17894.0	19358.8	167.718	65.55	95.69	1296
240.000	13.433	.07444	10.3700	468.206	18842.8	20331.6	171.870	66.65	97.20	1244
250.000	13.211	.07570	9.6544	430.847	19809.7	21323.6	175.932	67.83	98.82	1193
260.000	12.985	.07701	8.9891	395.837	20792.8	22333.1	179.903	69.09	100.57	1143
270.000	12.756	.07839	8.3684	363.003	21791.6	23359.4	183.788	70.43	102.44	1094
280.000	12.524	.07985	7.7877	332.207	22805.5	24402.5	187.591	71.85	104.44	1046
290.000	12.287	.08139	7.2429	303.340	23834.8	25462.5	191.318	73.34	106.56	999
300.000	12.046	.08301	6.7303	276.315	24879.8	26540.1	194.977	74.90	108.79	954
310.000	11.800	.08475	6.2470	251.071	25941.5	27636.4	198.577	76.52	111.13	909
320.000	11.548	.08659	5.7904	227.558	27021.6	28753.4	202.127	78.20	113.55	865
330.000	11.291	.08857	5.3584	205.740	28122.4	29893.8	205.640	79.89	116.02	823
340.000	11.027	.09068	4.9496	185.588	29246.4	31060.1	209.126	81.55	118.46	781
350.000	10.757	.09296	4.5627	167.078	30395.0	32254.2	212.591	83.06	120.74	742
360.000	10.481	.09541	4.1971	150.183	31567.8	33476.0	216.037	84.42	122.85	704
370.000	10.199	.09805	3.8526	134.869	32761.8	34722.9	219.437	86.88	126.03	666
380.000	9.910	.10091	3.5291	121.096	33980.7	35998.9	222.840	89.38	129.18	629
390.000	9.616	.10399	3.2270	108.802	35226.2	37306.1	226.235	91.82	132.19	595
400.000	9.317	.10733	2.9465	97.914	36493.4	38640.0	229.612	93.54	134.39	564
410.000	9.014	.11093	2.6878	88.341	37783.3	40001.9	232.975	96.76	138.02	534
420.000	8.709	.11482	2.4508	79.988	39093.1	41389.6	236.318	97.94	139.53	508
430.000	8.402	.11902	2.2350	72.753	40412.3	42792.7	239.620	99.27	141.09	484
440.000	8.095	.12353	2.0398	66.547	41740.8	44211.5	242.882	100.69	142.67	462
450.000	7.790	.12838	1.8639	61.290	43078.3	45645.8	246.105	102.16	144.20	442
460.000	7.487	.13356	1.7061	56.919	44423.9	47095.1	249.290	103.67	145.63	425
470.000	7.191	.13907	1.5651	53.379	45776.6	48557.9	252.436	105.19	146.90	411
480.000	6.902	.14489	1.4393	50.619	47134.6	50032.4	255.540	106.73	147.96	398
490.000	6.623	.15099	1.3274	48.581	48496.5	51516.3	258.600	108.25	148.77	389
500.000	6.356	.15733	1.2280	47.195	49860.3	53006.9	261.612	109.77	149.32	381
520.000	5.865	.17051	1.0615	46.045	52588.7	55998.9	267.479	112.77	149.76	372
540.000	5.434	.18402	.9302	46.462	55314.0	58994.3	273.131	115.69	149.74	369
560.000	5.062	.19755	.8256	47.813	58037.6	61988.6	278.576	118.56	149.71	370
580.000	4.741	.21093	.7411	49.634	60765.6	64984.3	283.832	121.36	149.91	372
600.000	4.462	.22410	.6718	51.723	63504.8	67986.9	288.922	124.10	150.39	377
620.000	4.219	.23701	.6141	54.020	66261.2	71001.5	293.864	126.79	151.10	382
640.000	4.006	.24964	.5656	56.457	69039.5	74032.4	298.676	129.42	152.02	387
660.000	3.817	.26199	.5243	58.976	71871.5	76963.5	303.281	131.91	152.91	391

DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	M/SEC
87.504	16.709	.05985	36.9030	1741.890	5532.7	6849.3	82.866	59.23	83.73
90.000	16.656	.06004	35.9360	1696.640	5737.6	7058.4	85.222	59.15	83.85
100.000	16.444	.06081	32.4298	1532.803	6561.4	7899.2	94.079	58.94	84.31
110.000	16.233	.06160	29.4181	1392.255	7389.5	8744.7	102.136	58.85	84.80
120.000	16.022	.06242	26.8012	1270.049	8222.3	9595.4	109.537	58.89	85.33
130.000	15.811	.06325	24.5063	1162.651	9060.1	10451.5	116.389	59.04	85.90
140.000	15.600	.06410	22.4781	1067.364	9903.4	11313.6	122.777	59.29	86.53
150.000	15.390	.06498	20.6736	982.128	10752.7	12182.2	128.769	59.65	87.21
160.000	15.179	.06588	19.0588	905.332	11608.6	13058.0	134.420	60.09	87.95
170.000	14.968	.06681	17.6064	835.688	12471.7	13941.5	139.776	60.62	88.76
180.000	14.758	.06776	16.2942	772.178	13342.7	14833.5	144.874	61.24	89.66
190.000	14.546	.06875	15.1036	713.959	14222.4	15734.8	149.747	61.94	90.63
200.000	14.334	.06976	14.0191	660.341	15111.6	16646.4	154.423	62.72	91.69
210.000	14.122	.07081	13.0277	610.756	16011.1	17569.0	158.924	63.59	92.85
220.000	13.908	.07190	12.1182	564.733	16921.9	18503.7	163.272	64.53	94.11
230.000	13.692	.07303	11.2810	521.881	17844.8	19451.5	167.485	65.56	95.47
240.000	13.475	.07421	10.5079	481.879	18789.4	20422.0	171.627	66.66	96.95
250.000	13.256	.07544	9.7916	444.462	19751.7	21411.3	175.678	67.85	98.54
260.000	13.035	.07672	9.1260	409.411	20729.9	22417.7	179.637	69.11	100.24
270.000	12.810	.07806	8.5056	376.553	21723.1	23440.5	183.509	70.45	102.06
280.000	12.583	.07947	7.9256	345.746	22731.0	24479.5	187.296	71.87	104.00
290.000	12.352	.08096	7.3820	316.879	23753.6	25534.8	191.007	73.36	106.05
300.000	12.117	.08253	6.8713	289.862	24791.2	26606.8	194.648	74.92	108.21
310.000	11.877	.08419	6.3902	264.628	25844.6	27696.9	198.227	76.55	110.46
320.000	11.634	.08596	5.9364	241.122	26915.7	28806.8	201.755	78.23	112.78
330.000	11.385	.08783	5.5078	219.306	28006.5	29938.9	205.242	79.92	115.14
340.000	11.131	.08984	5.1028	199.144	29119.4	31095.8	208.700	81.58	117.46
350.000	10.873	.09198	4.7201	180.606	30255.9	32279.3	212.134	83.09	119.61
360.000	10.609	.09426	4.3589	163.655	31415.3	33489.1	215.546	84.44	121.58
370.000	10.340	.09671	4.0187	148.255	32594.8	34722.5	218.909	86.91	124.60
380.000	10.067	.09934	3.6994	134.357	33798.0	35983.4	222.272	89.40	127.60
390.000	9.789	.10215	3.4010	121.898	35026.6	37274.0	225.624	91.83	130.45
400.000	9.509	.10516	3.1235	110.800	36276.0	38589.6	228.955	93.54	132.49
410.000	9.226	.10839	2.8667	100.976	37547.1	39931.7	232.269	96.75	135.95
420.000	8.941	.11184	2.6306	92.328	38837.4	41297.8	235.560	97.92	137.29
430.000	8.656	.11552	2.4146	84.755	40136.2	42677.7	238.807	99.23	138.70
440.000	8.372	.11945	2.2179	78.163	41444.1	44071.9	242.012	100.63	140.13
450.000	8.089	.12362	2.0395	72.467	42760.7	45480.4	245.178	102.09	141.56
460.000	7.810	.12805	1.8782	67.597	44085.9	46903.0	248.304	103.59	142.95
470.000	7.534	.13273	1.7329	63.495	45419.1	48339.2	251.393	105.11	144.27
480.000	7.264	.13766	1.6020	60.111	46759.5	49788.1	254.443	106.65	145.48
490.000	7.002	.14283	1.4844	57.403	48106.2	51248.3	257.454	108.18	146.55
500.000	6.748	.14820	1.3788	55.321	49458.0	52718.5	260.424	109.71	147.45
520.000	6.271	.15947	1.1991	52.822	52172.9	55681.3	266.235	112.73	148.73
540.000	5.841	.17120	1.0544	52.110	54897.6	58663.9	271.863	115.69	149.46
560.000	5.461	.18312	.9375	52.651	57629.5	61658.1	277.307	118.59	149.94
580.000	5.127	.19503	.8422	53.978	60370.7	64661.4	282.577	121.42	150.41
600.000	4.835	.20683	.7636	55.742	63125.0	67675.3	287.685	124.18	151.02
620.000	4.577	.21846	.6979	57.737	65897.5	70703.6	292.650	126.88	151.84
640.000	4.350	.22990	.6423	59.914	68692.1	73749.8	297.486	129.52	152.81
660.000	4.147	.24112	.5949	62.226	71512.3	76817.0	302.205	132.10	153.92
680.000	3.966	.25213	.5541	64.627	74360.6	79907.5	306.818	134.61	155.15
700.000	3.803	.26293	.5186	67.079	77239.2	83023.6	311.334	137.07	156.48



Table 30. Continued.

## PROPANE ISOBAR AT P = 250 BAR

DEG K	T	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR/DD	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
87.781	16.720	.05981	37.1076	1766.697	5536.9	7032.1	82.904	59.23	83.70	2379	
90.000	16.674	.05998	36.2456	1726.160	5718.6	7218.0	84.994	59.16	83.80	2354	
100.000	16.464	.06074	32.7226	1560.697	6539.7	8058.2	93.845	58.94	84.25	2249	
110.000	16.254	.06152	29.6970	1418.834	7365.1	8903.1	101.897	58.86	84.74	2152	
120.000	16.045	.06232	27.0685	1295.561	8195.0	9753.1	109.292	58.90	85.26	2062	
130.000	15.836	.06315	24.7636	1187.265	9029.8	10608.5	116.137	59.05	85.82	1978	
140.000	15.628	.06399	22.7267	1091.220	9870.0	11469.7	122.519	59.30	86.43	1899	
150.000	15.420	.06485	20.9145	1005.340	10716.0	12337.3	128.505	59.65	87.10	1824	
160.000	15.212	.06574	19.2931	927.995	11568.4	13211.9	134.149	60.10	87.83	1753	
170.000	15.004	.06665	17.8348	857.889	12427.9	14094.1	139.497	60.63	88.63	1686	
180.000	14.796	.06759	16.5173	793.966	13295.1	14984.7	144.587	61.25	89.50	1622	
190.000	14.588	.06855	15.3220	735.401	14170.6	15884.4	149.451	61.95	90.45	1560	
200.000	14.379	.06954	14.2335	681.490	15055.4	16794.0	154.116	62.74	91.49	1501	
210.000	14.170	.07057	13.2385	631.658	15950.2	17714.5	158.607	63.60	92.62	1444	
220.000	13.960	.07163	12.3261	585.430	16855.9	18646.8	162.943	64.55	93.85	1389	
230.000	13.749	.07273	11.4865	542.410	17773.4	19591.8	167.144	65.58	95.17	1336	
240.000	13.536	.07388	10.7115	502.272	18712.1	20559.0	171.272	66.68	96.60	1284	
250.000	13.322	.07506	9.9939	464.749	19668.1	21544.7	175.309	67.87	98.14	1234	
260.000	13.106	.07630	9.3276	429.618	20639.3	22546.8	179.251	69.14	99.79	1185	
270.000	12.888	.07759	8.7071	396.700	21624.9	23564.7	183.104	70.48	101.54	1138	
280.000	12.667	.07894	8.1276	365.851	22624.6	24598.2	186.872	71.90	103.41	1092	
290.000	12.443	.08036	7.5852	336.953	23638.1	25647.1	190.560	73.39	105.37	1047	
300.000	12.217	.08185	7.0763	309.914	24665.6	26712.0	194.176	74.96	107.44	1003	
310.000	11.987	.08343	6.5978	284.660	25708.2	27793.8	197.729	76.59	109.58	961	
320.000	11.753	.08508	6.1472	261.132	26767.3	28894.3	201.227	78.27	111.79	919	
330.000	11.516	.08684	5.7223	239.281	27845.0	30015.9	204.682	79.97	114.02	879	
340.000	11.275	.08869	5.3215	219.066	28943.6	31160.9	208.104	81.63	116.20	840	
350.000	11.030	.09066	4.9434	200.448	30064.6	32331.1	211.500	83.13	118.20	803	
360.000	10.782	.09275	4.5871	183.386	31207.3	33526.0	214.870	84.49	120.02	768	
370.000	10.530	.09497	4.2517	167.835	32368.8	34743.0	218.188	86.94	122.89	733	
380.000	10.275	.09732	3.9370	153.740	33552.9	35986.0	221.503	89.43	125.72	700	
390.000	10.018	.09982	3.6425	141.036	34761.4	37257.0	224.804	91.85	128.41	668	
400.000	9.759	.10247	3.3680	129.645	35989.7	38551.5	228.081	93.55	130.30	639	
410.000	9.499	.10528	3.1132	119.482	37239.0	39870.9	231.339	96.75	133.61	611	
420.000	9.238	.10825	2.8778	110.450	38506.6	41212.9	234.573	97.90	134.80	587	
430.000	8.978	.11139	2.6611	102.453	39782.5	42567.2	237.759	99.19	136.07	564	
440.000	8.719	.11469	2.4625	95.395	41067.0	43934.4	240.902	100.58	137.38	543	
450.000	8.462	.11818	2.2811	89.189	42360.2	45314.7	244.004	102.03	138.69	524	
460.000	8.208	.12184	2.1156	83.756	43662.3	46708.2	247.067	103.52	140.01	506	
470.000	7.957	.12568	1.9652	79.033	44972.9	48114.9	250.092	105.03	141.31	491	
480.000	7.710	.12969	1.8284	74.966	46292.0	49534.3	253.081	106.56	142.57	476	
490.000	7.469	.13388	1.7043	71.512	47619.0	50966.1	256.033	108.10	143.77	464	
500.000	7.234	.13823	1.5916	68.632	48953.7	52409.5	258.949	109.63	144.90	453	
520.000	6.785	.14738	1.3966	64.453	51643.2	55327.8	264.672	112.68	146.86	436	
540.000	6.369	.15701	1.2360	62.119	54355.9	58281.1	270.244	115.67	148.41	425	
560.000	5.990	.16695	1.1034	61.273	57080.1	61261.8	275.664	118.60	149.61	418	
580.000	5.649	.17704	.9935	61.539	59838.3	64264.2	280.932	121.46	150.61	415	
600.000	5.343	.18715	.9018	62.576	62607.1	67285.9	286.054	124.25	151.56	416	
620.000	5.071	.19720	.8246	64.108	65396.6	70326.7	291.039	126.97	152.54	417	
640.000	4.827	.20715	.7590	65.927	68209.3	73388.0	295.899	129.62	153.62	420	
660.000	4.609	.21696	.7027	67.908	71048.7	76472.1	300.644	132.24	154.72	424	

DEG K	MOL/L	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
88.241	16.739	37.4434	1808.026	5548.7	7336.7	82.968	59.22	83.64	2406
90.000	16.702	36.7570	1775.453	5687.4	7438.9	84.620	59.17	83.72	2386
100.000	16.495	33.2064	1607.288	6504.6	8323.3	93.462	58.95	84.16	2281
110.000	16.289	30.1577	1463.210	7325.5	9167.3	101.505	58.87	84.64	2184
120.000	16.083	27.5096	1338.119	8150.9	10016.2	108.890	58.91	85.15	2094
130.000	15.878	25.1880	1228.301	8980.9	10870.3	115.726	59.06	85.69	2010
140.000	15.673	23.1365	1130.971	9816.1	11730.2	122.098	59.31	86.29	1931
150.000	15.469	21.3115	1043.995	10656.8	12596.3	128.073	59.67	86.94	1857
160.000	15.265	19.6787	965.709	11503.8	13469.1	133.705	60.11	87.65	1786
170.000	15.061	18.2104	894.795	12357.5	14349.4	139.042	60.64	88.42	1720
180.000	14.858	16.8838	830.181	13218.6	15237.7	144.119	61.26	89.26	1656
190.000	14.654	15.6806	771.018	14087.7	16134.9	148.969	61.97	90.18	1595
200.000	14.451	14.5850	716.592	14965.7	17041.7	153.620	62.76	91.19	1536
210.000	14.247	13.5839	666.321	15853.2	17958.9	158.095	63.63	92.28	1480
220.000	14.043	12.6660	619.719	16751.2	18887.5	162.414	64.58	93.46	1426
230.000	13.838	11.8219	576.385	17660.4	19828.3	166.596	65.61	94.73	1373
240.000	13.633	11.0432	535.985	18590.2	20790.8	170.705	66.72	96.10	1323
250.000	13.426	10.3227	498.243	19536.6	21771.0	174.719	67.91	97.57	1274
260.000	13.218	9.6544	462.931	20497.4	22767.0	178.637	69.17	99.14	1226
270.000	13.009	9.0327	429.864	21471.9	23778.0	182.464	70.52	100.80	1180
280.000	12.798	8.4529	398.888	22459.4	24803.6	186.203	71.95	102.57	1135
290.000	12.585	7.9111	369.880	23459.8	25843.6	189.860	73.45	104.43	1092
300.000	12.370	7.4036	342.739	24473.2	26898.4	193.442	75.02	106.37	1049
310.000	12.153	6.9273	317.382	25500.4	27968.9	196.957	76.65	108.38	1008
320.000	11.934	6.4798	293.743	26542.8	29056.7	200.415	78.33	110.45	969
330.000	11.712	6.0587	271.763	27602.6	30164.1	203.827	80.03	112.53	930
340.000	11.488	5.6623	251.391	28682.0	31293.5	207.202	81.70	114.55	894
350.000	11.261	5.2889	232.580	29782.4	32446.4	210.548	83.20	116.59	858
360.000	11.033	4.9375	215.279	30903.3	33622.4	213.864	84.55	118.05	825
370.000	10.803	4.6071	199.438	32041.8	34818.9	217.127	87.01	120.75	792
380.000	10.571	4.2968	184.996	33201.8	36039.7	220.382	89.50	123.43	760
390.000	10.338	4.0061	171.889	34385.3	37287.1	223.622	91.91	125.97	730
400.000	10.105	3.7343	160.041	35587.8	38556.6	226.836	93.59	127.72	703
410.000	9.872	3.4811	149.370	36810.7	39849.6	230.029	96.78	130.91	676
420.000	9.639	3.2457	139.787	38051.7	41164.0	233.196	97.91	131.98	653
430.000	9.408	3.0277	131.202	39300.6	42489.5	236.315	99.19	133.14	631
440.000	9.178	2.8262	123.523	40558.2	43826.9	239.389	100.56	134.34	611
450.000	8.950	2.6405	116.663	41824.6	45176.4	242.422	102.00	135.57	592
460.000	8.725	2.4696	110.544	43100.0	46538.3	245.415	103.47	136.81	575
470.000	8.504	2.3126	105.092	44384.7	47912.6	248.371	104.97	138.05	559
480.000	8.285	2.1685	100.249	45678.5	49299.3	251.290	106.49	139.29	545
490.000	8.071	2.0363	95.963	46981.4	50698.4	254.175	108.02	140.52	532
500.000	7.861	1.9150	92.192	48293.4	52109.7	257.026	109.55	141.74	520
520.000	7.455	1.7014	86.063	50944.1	54968.0	262.631	112.61	144.07	499
540.000	7.071	1.5213	81.637	53628.9	57871.5	268.110	115.62	146.23	483
560.000	6.711	1.3689	78.711	56345.5	60816.0	273.464	118.58	148.18	472
580.000	6.376	1.2395	77.073	59092.0	63797.2	278.695	121.47	149.91	464
600.000	6.068	1.1294	76.493	61866.9	66811.2	283.803	124.29	151.47	459
620.000	5.787	1.0352	76.745	64669.4	69855.1	288.794	127.04	152.91	457
640.000	5.527	.9541	77.619	67499.7	72927.1	293.670	129.72	154.29	457
660.000	5.293	.8840	78.939	70358.4	76026.6	298.439	132.33	155.66	458
680.000	5.079	.8230	80.565	73246.5	79153.4	303.106	134.87	157.04	461
700.000	4.883	.7695	82.386	76165.0	82308.2	307.678	137.35	158.45	464



Table 30. Continued.

## PROPANE ISOBAR AT P = 350 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/OD BAR/L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	M M/SEC
88.700	16.756	.05968	37.7732	1849.338	5552.5	7641.2	83.036	59.22	83.59	2433
90.000	16.730	.05977	37.2640	1824.958	5657.8	7749.9	84.252	59.18	83.64	2418
100.000	16.526	.06051	33.6854	1654.017	6470.6	8588.5	93.086	58.96	84.08	2312
110.000	16.323	.06126	30.6134	1507.682	7287.3	9431.6	101.120	58.88	84.54	2215
120.000	16.120	.06204	27.9458	1380.746	8108.2	10279.5	108.497	58.92	85.04	2125
130.000	15.918	.06282	25.6072	1269.362	8933.7	11132.5	115.324	59.07	85.57	2042
140.000	15.716	.06363	23.5409	1170.718	9764.2	11991.1	121.686	59.33	86.16	1963
150.000	15.516	.06445	21.7030	1082.620	10600.0	12855.8	127.651	59.68	86.79	1889
160.000	15.315	.06529	20.0586	1003.371	11441.8	13727.1	133.274	60.12	87.48	1819
170.000	15.116	.06616	18.5800	931.623	12290.1	14605.5	138.599	60.66	88.23	1752
180.000	14.917	.06704	17.2444	866.296	13145.5	15491.9	143.665	61.28	89.05	1689
190.000	14.718	.06795	16.0328	806.502	14008.7	16386.8	148.503	61.99	89.95	1629
200.000	14.519	.06888	14.9298	751.535	14880.4	17291.0	153.141	62.78	90.92	1571
210.000	14.320	.06983	13.9221	700.793	15761.3	18205.4	157.602	63.65	91.97	1515
220.000	14.122	.07081	12.9985	653.786	16652.2	19130.7	161.906	64.60	93.11	1461
230.000	13.923	.07183	12.1493	610.101	17554.0	20067.9	166.072	65.63	94.34	1410
240.000	13.723	.07287	11.3663	569.399	18475.9	21026.3	170.163	66.75	95.66	1360
250.000	13.523	.07395	10.6423	531.397	19413.7	22001.9	174.158	67.94	97.08	1312
260.000	13.323	.07506	9.9711	495.859	20365.5	22992.6	178.056	69.21	98.58	1265
270.000	13.121	.07621	9.3472	462.592	21330.3	23997.8	181.860	70.56	100.18	1220
280.000	12.918	.07741	8.7660	431.437	22307.4	25016.7	185.576	71.99	101.87	1176
290.000	12.715	.07865	8.2234	402.262	23296.7	26049.4	189.207	73.49	103.65	1134
300.000	12.510	.07994	7.7159	374.960	24298.1	27096.0	192.761	75.07	105.51	1093
310.000	12.303	.08128	7.2402	349.440	25312.6	28157.4	196.247	76.70	107.43	1053
320.000	12.095	.08268	6.7938	325.628	26341.5	29235.2	199.673	78.39	109.39	1015
330.000	11.885	.08413	6.3743	303.459	27386.9	30331.6	203.050	80.09	111.37	978
340.000	11.675	.08565	5.9799	282.874	28451.0	31448.8	206.389	81.76	113.29	942
350.000	11.463	.08724	5.6089	263.819	29535.3	32588.6	209.697	83.27	115.03	909
360.000	11.250	.08889	5.2600	246.240	30639.3	33750.5	212.974	84.62	116.58	877
370.000	11.036	.09061	4.9319	230.081	31760.3	34931.8	216.195	87.08	119.19	845
380.000	10.821	.09241	4.6237	215.282	32902.2	36136.6	219.407	89.56	121.78	814
390.000	10.606	.09428	4.3345	201.776	34067.2	37367.1	222.604	91.97	124.25	786
400.000	10.392	.09623	4.0638	189.494	35250.9	38618.9	225.773	93.65	125.93	760
410.000	10.178	.09825	3.8107	178.354	36454.8	39893.7	228.920	96.82	129.05	734
420.000	9.965	.10036	3.5746	168.279	37676.8	41189.2	232.042	97.96	130.07	711
430.000	9.753	.10253	3.3548	159.181	38906.8	42495.5	235.116	99.22	131.19	690
440.000	9.543	.10479	3.1506	150.975	40145.6	43813.1	238.145	100.58	132.35	671
450.000	9.336	.10712	2.9612	143.580	41393.5	45142.6	241.132	102.01	133.54	652
460.000	9.131	.10952	2.7859	136.916	42650.8	46484.0	244.081	103.47	134.75	635
470.000	8.929	.11200	2.6237	130.912	43917.7	47837.5	246.991	104.97	135.96	620
480.000	8.730	.11455	2.4737	125.503	45194.1	49203.2	249.867	106.48	137.18	605
490.000	8.535	.11717	2.3352	120.634	46480.3	50581.2	252.708	108.00	138.41	592
500.000	8.343	.11986	2.2072	116.257	47776.3	51971.4	255.516	109.53	139.63	579
520.000	7.971	.12545	1.9796	108.830	50397.3	54788.1	261.040	112.57	142.04	558
540.000	7.616	.13130	1.7848	102.976	53056.9	57652.5	266.445	115.59	144.39	540
560.000	7.278	.13740	1.6175	98.520	55754.1	60562.9	271.737	118.56	146.63	525
580.000	6.959	.14369	1.4734	95.311	58487.7	63516.8	276.919	121.46	148.74	514
600.000	6.660	.15015	1.3488	93.205	61256.4	66511.5	281.996	124.30	150.71	506
620.000	6.381	.15672	1.2407	92.051	64058.9	69544.2	286.967	127.08	152.54	500
640.000	6.121	.16338	1.1465	91.694	66894.3	72612.4	291.838	129.77	154.26	497
660.000	5.880	.17006	1.0642	91.983	69762.0	75714.2	296.610	132.40	155.88	495

89.159	16.774	.05962	38.0971	1890.637	5561.0	7945.7	83.106	59.21	83.54	2459
90.000	16.757	.05968	37.7663	1874.656	5628.9	8016.0	83.890	59.19	83.57	2450
100.000	16.556	.06040	34.1598	1700.899	6437.7	8853.8	92.716	58.97	84.00	2343
110.000	16.355	.06114	31.0643	1552.256	7250.4	9696.1	100.743	58.89	84.46	2246
120.000	16.156	.06190	28.3770	1423.418	8067.1	10543.1	108.111	58.93	84.94	2156
130.000	15.957	.06267	26.0214	1310.459	8888.2	11395.0	114.930	59.08	85.46	2073
140.000	15.758	.06346	23.9403	1210.472	9714.1	12252.5	121.284	59.34	86.03	1994
150.000	15.561	.06426	22.0892	1121.228	10545.3	13115.8	127.240	59.69	86.65	1921
160.000	15.364	.06509	20.4332	1040.991	11382.2	13985.7	132.853	60.14	87.32	1851
170.000	15.168	.06593	18.9442	968.387	12225.5	14862.5	138.168	60.68	88.06	1785
180.000	14.973	.06679	17.5991	902.315	13075.6	15747.0	143.224	61.30	88.86	1722
190.000	14.778	.06767	16.3792	841.880	13933.2	16639.9	148.051	62.01	89.73	1662
200.000	14.584	.06857	15.2685	786.340	14799.1	17541.9	152.677	62.80	90.68	1604
210.000	14.390	.06949	14.2540	735.103	15674.0	18453.7	157.126	63.67	91.70	1549
220.000	14.196	.07044	13.3242	687.661	16558.5	19376.2	161.417	64.63	92.81	1496
230.000	14.002	.07142	12.4696	643.597	17453.5	20310.2	165.568	65.66	94.00	1445
240.000	13.809	.07242	11.6818	602.561	18368.2	21264.9	169.644	66.78	95.28	1396
250.000	13.615	.07345	10.9537	564.264	19298.5	22236.5	173.623	67.97	96.65	1348
260.000	13.420	.07451	10.2789	528.464	20242.2	23222.8	177.503	69.25	98.11	1303
270.000	13.225	.07561	9.6522	494.960	21198.5	24222.9	181.289	70.60	99.66	1258
280.000	13.030	.07674	9.0688	463.585	22168.5	25236.3	184.984	72.03	101.29	1215
290.000	12.834	.07792	8.5245	434.202	23146.2	26262.9	188.593	73.54	103.00	1174
300.000	12.638	.07913	8.0157	406.697	24137.5	27302.6	192.124	75.11	104.79	1134
310.000	12.440	.08039	7.5394	380.972	25141.1	28356.6	195.585	76.75	106.64	1095
320.000	12.242	.08169	7.0928	356.946	26158.6	29426.2	198.985	78.44	108.54	1058
330.000	12.043	.08304	6.6736	334.548	27192.0	30513.6	202.335	80.15	110.44	1022
340.000	11.843	.08444	6.2797	313.715	28243.6	31621.2	205.646	81.82	112.29	988
350.000	11.642	.08589	5.9094	294.388	29314.9	32750.6	208.923	83.33	113.96	955
360.000	11.441	.08740	5.5612	276.508	30405.4	33901.5	212.169	84.69	115.44	924
370.000	11.240	.08897	5.2339	260.017	31512.4	35071.1	215.358	87.14	117.99	893
380.000	11.039	.09059	4.9263	244.854	32640.1	36263.6	218.538	89.62	120.53	864
390.000	10.838	.09227	4.6375	230.955	33790.6	37481.4	221.701	92.03	122.95	836
400.000	10.637	.09401	4.3665	218.252	34959.7	38720.0	224.837	93.71	124.59	811
410.000	10.438	.09581	4.1127	206.670	36149.0	39981.2	227.951	96.88	127.68	785
420.000	10.240	.09766	3.8753	196.134	37356.5	41262.9	231.039	98.01	128.68	764
430.000	10.043	.09957	3.6536	186.565	38572.2	42555.1	234.080	99.27	129.78	743
440.000	9.848	.10154	3.4467	177.881	39796.8	43858.6	237.076	100.62	130.92	724
450.000	9.655	.10357	3.2540	170.006	41030.9	45173.7	240.032	102.04	132.10	706
460.000	9.465	.10565	3.0747	162.865	42274.7	46500.7	242.949	103.50	133.30	689
470.000	9.278	.10778	2.9081	156.387	43528.4	47839.8	245.828	104.98	134.51	674
480.000	9.093	.10997	2.7532	150.507	44792.2	49191.0	248.673	106.49	135.73	659
490.000	8.912	.11221	2.6094	145.167	46065.0	50554.3	251.484	108.01	136.94	646
500.000	8.734	.11450	2.4758	140.317	47350.0	51929.8	254.263	109.53	138.16	633
510.000	8.558	.11682	2.3365	131.916	48648.6	53329.4	257.029	111.05	139.40	621
520.000	8.388	.11922	2.2026	125.031	49948.6	54717.4	259.729	112.57	140.59	611
530.000	8.218	.12163	2.0706	118.146	51258.1	56153.3	262.464	114.09	141.78	601
540.000	8.056	.12413	1.9422	111.279	52588.1	57553.3	265.168	115.58	143.00	592
550.000	7.899	.12663	1.8183	104.465	53948.1	58953.3	267.894	117.05	144.21	583
560.000	7.739	.12922	1.6942	97.697	55368.1	60363.9	270.623	118.55	145.45	576
570.000	7.579	.13186	1.5709	90.979	56848.1	61774.4	273.368	120.01	146.71	569
580.000	7.437	.13467	1.4484	84.317	58388.1	63184.2	276.124	121.47	147.98	563
590.000	7.299	.13759	1.3273	77.617	59948.1	64644.2	278.894	122.88	149.26	557
600.000	7.150	.14063	1.2084	70.879	61568.1	66154.2	281.673	124.24	150.55	552
610.000	6.999	.14384	1.0928	64.209	63248.1	67714.2	284.464	125.58	151.85	547
620.000	6.849	.14719	0.9797	57.597	64988.1	69324.2	287.273	126.85	153.15	543
630.000	6.694	.15069	0.8697	51.047	66798.1	70984.2	290.104	128.08	154.45	539
640.000	6.534	.15434	0.7628	44.567	68698.1	72694.2	292.954	129.28	155.72	536
650.000	6.369	.15814	0.6597	38.147	70698.1	74454.2	295.824	130.45	156.98	533
660.000	6.204	.16209	0.5604	31.787	72798.1	76264.2	298.714	131.59	158.21	531
670.000	6.039	.16619	0.4657	25.487	74998.1	78124.2	301.624	132.71	159.41	529
680.000	5.874	.17044	0.3757	19.247	77298.1	80034.2	304.554	133.81	160.58	527
690.000	5.709	.17484	0.2904	13.067	79698.1	81994.2	307.504	134.89	161.72	525
700.000	5.544	.17939	0.2099	6.947	82198.1	83994.2	310.474	135.94	162.89	523
710.000	5.379	.18409	0.1344	0.887	84798.1	86034.2	313.464	137.01	164.02	521
720.000	5.214	.18894	0.0639	0.000	87398.1	88114.2	316.474	138.06	165.11	519
730.000	5.049	.19394	0.0000	0.000	90000.0	90244.2	319.504	139.09	166.17	517
740.000	4.884	.19909	0.0000	0.000	92700.0	92414.2	322.554	140.11	167.20	515
750.000	4.719	.20439	0.0000	0.000	95400.0	94624.2	325.624	141.11	168.21	513
760.000	4.554	.20984	0.0000	0.000	98100.0	96874.2	328.714	142.09	169.19	511
770.000	4.389	.21544	0.0000	0.000	100900.0	99164.2	331.824	143.06	170.14	509
780.000	4.224	.22119	0.0000	0.000	103700.0	101494.2	334.954	144.01	171.17	507
790.000	4.059	.22709	0.0000	0.000	106500.0	103864.2	338.104	144.94	172.18	505
800.000	3.894	.23314	0.0000	0.000	109300.0	106274.2	341.274	145.85	173.17	503
810.000	3.729	.23934	0.0000	0.000	112100.0	108724.2	344.464	146.74	174.14	501
820.000	3.564	.24569	0.0000	0.000	114900.0	111214.2	347.674	147.61	175.09	499
830.000	3.399	.25219	0.0000	0.000	117700.0	113744.2	350.904	148.46	176.02	497
840.000	3.234	.25884	0.0000	0.000	120500.0	116314.2	354.154	149.29	176.92	495
850.000	3.069	.26564	0.0000	0.000	123300.0	118924.2	357.424	150.11	177.79	493
860.000	2.904	.27259	0.0000	0.000	126100.0	121574.2	360.714	150.92	178.64	491
870.000	2.739	.27969	0.0000	0.000	128900.0	124264.2	364.024	151.71	179.47	489
880.000	2.574	.28694	0.0000	0.000	131700.0	126994.2	367.354	152.49	180.28	487
890.000	2.409	.29434	0.0000	0.000	134500.0	129764.2	370.704	153.25	181.07	485
900.000	2.244	.30189	0.0000	0.000	137300.0	132574.2	374.074	154.00	181.84	483
910.000	2.079	.30959	0.0000	0.000	140100.0	135424.2	377.464	154.71	182.59	481
920.000	1.914	.31744	0.0000	0.000	142900.0	138314.2	380.874	155.40	183.32	479
930.000	1.749	.32544	0.0000	0.000	145700.0	141244.2	384.304	156.07	184.03	477
940.000	1.584	.33359	0.0000	0.000	148500.0	144214.2	387.754	156.72	184.72	475
950.000	1.419	.34189	0.0000	0.000	151300.0	147224.2	391.224	157.35	185.39	473
960.000	1.254	.35034	0.0000	0.000	154100.0	150274.2	394.714	157.96	186.04	471
970.000	1.089	.35894	0.0000	0.000	156900.0	153364.2	398.224	158.55	186.67	469
980.000	0.924	.36769	0.0000	0.000	159700.0	156494.2	401.754	159.13	187.28	467
990.000	0.759	.37659	0.0000	0.000	162500.0	159664.2	405.304	159.70	187.92	465
1000.000	0.594	.38564	0.0000	0.000	165300.0	162874.2	408.874	160.25	188.53	463



Table 30. Continued.

## PROPANE ISOBAR AT P = 500 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
90.074	16.807	.05950	38.7282	1973.214	5579.6	8554.5	83.253	59.21	83.45	2511
100.000	16.613	.06019	35.0948	1795.078	6375.1	9384.8	91.996	59.00	83.86	2405
110.000	16.418	.06091	31.9528	1641.745	7180.0	10225.5	100.008	58.92	84.30	2307
120.000	16.224	.06164	29.2258	1509.016	7988.8	11070.8	107.362	58.96	84.76	2218
130.000	16.031	.06238	26.8359	1392.797	8801.8	11920.9	114.165	59.11	85.27	2134
140.000	15.838	.06314	24.7248	1290.044	9619.4	12776.2	120.504	59.37	85.81	2056
150.000	15.647	.06391	22.8473	1198.434	10441.9	13637.3	126.444	59.72	86.41	1982
160.000	15.457	.06470	21.1676	1116.155	11269.8	14504.6	132.041	60.17	87.06	1913
170.000	15.268	.06550	19.6572	1041.775	12103.8	15378.6	137.339	60.71	87.76	1847
180.000	15.080	.06631	18.2930	974.151	12944.3	16260.4	142.377	61.34	88.53	1785
190.000	14.892	.06715	17.0556	912.353	13791.9	17149.4	147.185	62.05	89.36	1726
200.000	14.706	.06800	15.9292	855.622	14647.4	18047.4	151.791	62.84	90.27	1669
210.000	14.520	.06887	14.9003	803.328	15511.4	18954.9	156.218	63.72	91.25	1615
220.000	14.335	.06976	13.9575	754.953	16384.6	19872.6	160.487	64.68	92.30	1563
230.000	14.150	.07067	13.0911	710.049	17267.7	20801.2	164.615	65.71	93.44	1513
240.000	13.966	.07160	12.2928	668.270	18170.0	21750.1	168.665	66.83	94.66	1465
250.000	13.782	.07256	11.5552	629.305	19087.2	22715.1	172.617	68.03	95.96	1418
260.000	13.599	.07354	10.8721	592.898	20017.3	23694.1	176.469	69.31	97.34	1374
270.000	13.415	.07454	10.2381	558.834	20959.1	24686.1	180.224	70.67	98.81	1331
280.000	13.232	.07557	9.6463	526.935	21912.1	25690.7	183.887	72.11	100.36	1289
290.000	13.049	.07663	9.0987	497.051	22875.9	26707.5	187.463	73.62	101.99	1249
300.000	12.866	.07772	8.5854	469.053	23850.5	27736.7	190.958	75.20	103.68	1210
310.000	12.683	.07884	8.1054	442.835	24836.8	28779.0	194.381	76.85	105.44	1173
320.000	12.500	.08000	7.6559	418.304	25836.1	29836.1	197.741	78.54	107.24	1138
330.000	12.317	.08119	7.2343	395.380	26850.6	30910.0	201.049	80.26	109.05	1103
340.000	12.134	.08241	6.8385	373.990	27882.6	32003.2	204.317	81.93	110.80	1070
350.000	11.951	.08367	6.4667	354.070	28933.7	33117.3	207.550	83.44	112.38	1039
360.000	11.769	.08497	6.1171	335.552	30003.5	34251.9	210.750	84.80	113.79	1010
370.000	11.587	.08630	5.7884	318.381	31089.4	35404.6	213.893	87.26	116.26	980
380.000	11.405	.08768	5.4793	302.492	32195.6	36579.5	217.026	89.74	118.74	952
390.000	11.225	.08909	5.1887	287.825	33324.6	37779.0	220.141	92.15	121.10	926
400.000	11.045	.09054	4.9154	274.314	34472.1	38999.0	223.230	93.83	122.71	901
410.000	10.866	.09203	4.6587	261.895	35640.0	40241.3	226.297	97.00	125.77	877
420.000	10.689	.09355	4.4176	250.498	36826.2	41503.8	229.339	98.12	126.76	856
430.000	10.514	.09511	4.1913	240.055	38021.1	42776.8	232.335	99.38	127.84	836
440.000	10.340	.09671	3.9792	230.495	39225.4	44060.9	235.287	100.73	129.00	818
450.000	10.169	.09834	3.7803	221.749	40439.7	45356.8	238.199	102.13	130.18	800
460.000	9.999	.10001	3.5941	213.748	41664.3	46664.6	241.073	103.58	131.39	784
470.000	9.832	.10171	3.4198	206.427	42899.3	47984.6	243.912	105.06	132.61	768
480.000	9.668	.10343	3.2567	199.725	44145.0	49316.8	246.717	106.56	133.83	754
490.000	9.506	.10519	3.1041	193.582	45401.5	50661.2	249.489	108.07	135.06	740
500.000	9.347	.10698	2.9613	187.947	46668.8	52017.9	252.230	109.58	136.29	728
520.000	9.038	.11065	2.7028	178.016	49235.9	54768.2	257.623	112.61	138.74	705
540.000	8.740	.11442	2.4762	169.613	51846.5	57567.3	262.904	115.62	141.17	685
560.000	8.454	.11829	2.2771	162.497	54500.4	60414.9	268.082	118.58	143.59	667
580.000	8.179	.12226	2.1016	156.492	57197.6	63310.4	273.162	121.50	145.96	652
600.000	7.917	.12632	1.9465	151.468	59937.4	66253.1	278.150	124.35	148.30	640
620.000	7.665	.13046	1.8088	147.328	62719.1	69241.9	283.050	127.14	150.57	629
640.000	7.426	.13467	1.6861	143.993	65542.0	72275.5	287.865	129.46	152.74	620

T	DEG K	DEN	VOL	DP/OT	DP/OD	E	H	S	CV	CP	M/SEC	H
90.987	16.839	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC	
100.000	16.667		.05938	39.3382	2055.786	5600.0	9163.0	83.409	59.21	83.36	2561	
110.000	16.477		.06000	36.0135	1889.938	6316.1	9916.0	91.299	59.02	83.73	2465	
120.000	16.288		.06069	32.8245	1731.723	7114.0	10755.4	99.298	58.94	84.15	2367	
130.000	16.100		.06139	30.0575	1594.966	7915.5	11599.2	106.639	58.99	84.61	2277	
140.000	15.914		.06211	27.6332	1475.373	8721.0	12447.6	113.429	59.14	85.10	2194	
150.000	15.728		.06284	25.4920	1369.762	9530.9	13301.2	119.755	59.40	85.63	2116	
160.000	15.544		.06358	23.5876	1275.691	10345.5	14160.3	125.681	59.76	86.20	2042	
170.000	15.361		.06433	21.8839	1191.285	11165.4	15025.4	131.264	60.21	86.83	1973	
180.000	15.179		.06510	20.3519	1115.051	11991.0	15897.1	136.548	60.75	87.51	1908	
190.000	14.998		.06588	18.9680	1045.801	12822.9	16775.8	141.570	61.38	88.25	1846	
200.000	14.818		.06668	17.7127	982.568	13661.8	17662.3	146.363	62.09	89.06	1787	
210.000	14.639		.06748	16.5699	924.563	14508.2	18557.2	150.953	62.88	89.93	1731	
220.000	14.462		.06831	15.5261	871.137	15362.7	19461.2	155.363	63.76	90.88	1677	
230.000	14.285		.06915	14.5696	821.747	16226.1	20375.0	159.614	64.72	91.90	1626	
240.000	14.109		.07000	13.6906	775.943	17099.1	21299.4	163.723	65.77	92.99	1577	
250.000	13.934		.07088	12.8808	733.343	17990.9	22243.6	167.753	66.89	94.17	1530	
260.000	13.759		.07177	12.1327	693.631	18897.3	23203.4	171.684	68.09	95.42	1484	
270.000	13.585		.07268	11.4401	656.537	19816.0	24176.8	175.514	69.38	96.75	1440	
280.000	13.412		.07361	10.7974	621.828	20746.1	25162.7	179.246	70.74	98.17	1398	
290.000	13.239		.07456	10.1998	589.325	21686.9	26160.6	182.885	72.18	99.66	1358	
300.000	13.067		.07554	9.6430	558.861	22638.0	27170.1	186.435	73.70	101.23	1319	
310.000	12.895		.07653	9.1234	530.298	23599.5	28191.4	189.903	75.28	102.86	1281	
320.000	12.723		.07755	8.6377	503.519	24572.2	29225.2	193.298	76.93	104.56	1245	
330.000	12.553		.07859	8.1830	478.425	25557.5	30273.2	196.630	78.63	106.30	1211	
340.000	12.382		.07966	7.7568	454.921	26557.6	31337.5	199.908	80.35	108.05	1177	
350.000	12.214		.08076	7.3568	432.932	27574.8	32420.4	203.145	82.03	109.75	1146	
360.000	12.043		.08188	6.9810	412.386	28610.8	33523.7	206.347	83.55	111.28	1116	
370.000	11.876		.08303	6.6278	393.219	29665.2	34647.0	209.515	84.91	112.63	1087	
380.000	11.709		.08420	6.2955	375.366	30735.6	35787.9	212.625	87.37	115.07	1058	
390.000	11.542		.08541	5.9828	358.764	31826.2	36950.7	215.726	89.86	117.51	1031	
400.000	11.377		.08664	5.6884	343.354	32939.6	38137.8	218.810	92.26	119.85	1005	
410.000	11.213		.08789	5.4113	329.076	34071.5	39345.2	221.867	93.94	121.44	982	
420.000	11.051		.08918	5.1503	315.867	35224.0	40574.7	224.902	97.11	124.49	958	
430.000	10.891		.09049	4.9047	303.667	36395.2	41824.5	227.913	98.23	125.48	937	
440.000	10.732		.09182	4.6735	292.411	37575.2	43084.6	230.878	99.49	126.57	918	
450.000	10.575		.09318	4.4560	282.038	38765.1	44356.1	233.801	100.83	127.73	900	
460.000	10.420		.09457	4.2514	272.485	39965.4	45639.4	236.685	102.24	128.93	882	
470.000	10.267		.09597	4.0589	263.690	41176.4	46934.8	239.533	103.69	130.16	866	
480.000	10.116		.09740	3.8779	255.593	42398.5	48242.6	242.345	105.16	131.40	851	
490.000	9.968		.09885	3.7077	248.136	43631.7	49562.8	245.124	106.66	132.64	836	
500.000	9.822		.10032	3.5478	241.265	44876.1	50895.4	247.872	108.16	133.89	822	
510.000	9.678		.10181	3.3974	234.929	46131.9	52240.5	250.590	109.67	135.13	810	
520.000	9.538		.10485	3.1230	223.670	48677.3	54968.0	255.938	112.69	137.61	787	
530.000	9.400		.10795	2.8802	214.028	51268.0	57745.0	261.178	115.69	140.08	766	
540.000	9.264		.11112	2.6648	205.733	53903.9	60571.0	266.316	118.65	142.51	748	
550.000	9.127		.11435	2.4735	198.575	56584.7	63445.4	271.359	121.56	144.92	732	
560.000	8.991		.11763	2.3028	192.395	59309.8	66367.6	276.313	124.41	147.29	718	
570.000	8.857		.12097	2.1502	187.073	62078.7	69336.8	281.180	127.20	149.62	706	
580.000	8.725		.12436	2.0133	182.519	64890.8	72352.2	285.967	129.92	151.90	695	
590.000	8.594		.12779	1.8900	178.662	67745.2	75412.6	290.676	132.58	154.13	686	
600.000	8.468		.13127	1.7787	175.446	70641.0	78517.0	295.309	135.17	156.29	678	
610.000	8.347		.13478	1.6778	172.822	73577.4	81664.0	299.870	137.68	158.40	671	



## PROPANE ISOBAR AT P = 700 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	M M/SEC
91.898	16.870	.05928	39.9283	2138.382	5621.9	9771.3	83.573	59.22	83.29	2611
100.000	16.719	.05981	36.9168	1985.516	6260.6	10447.5	90.624	59.06	83.61	2524
110.000	16.533	.06048	33.6808	1822.259	7051.8	11285.7	98.611	58.98	84.03	2426
120.000	16.349	.06116	30.8737	1681.337	7846.6	12128.1	105.940	59.02	84.47	2336
130.000	16.166	.06186	28.4148	1558.256	8645.2	12975.2	112.720	59.17	84.95	2252
140.000	15.985	.06256	26.2431	1439.676	9448.0	13827.2	119.033	59.43	85.46	2174
150.000	15.804	.06327	24.3118	1353.065	10255.4	14684.6	124.948	59.79	86.03	2101
160.000	15.625	.06400	22.5839	1266.451	11067.9	15547.9	130.519	60.24	86.64	2032
170.000	15.448	.06474	21.0301	1188.292	11886.0	16417.5	135.791	60.79	87.30	1967
180.000	15.271	.06548	19.6262	1117.346	12710.3	17294.1	140.801	61.42	88.02	1905
190.000	15.096	.06624	18.3528	1052.614	13541.2	18178.2	145.580	62.13	88.81	1847
200.000	14.923	.06701	17.1933	993.275	14379.5	19070.4	150.457	62.93	89.66	1791
210.000	14.750	.06780	16.1340	938.655	15225.8	19971.5	154.553	63.81	90.58	1738
220.000	14.579	.06859	15.1633	888.192	16080.7	20882.2	158.789	64.77	91.57	1687
230.000	14.409	.06940	14.2713	841.416	16944.9	21803.1	162.883	65.82	92.63	1638
240.000	14.239	.07023	13.4493	797.934	17827.7	22743.6	166.897	66.94	93.78	1592
250.000	14.071	.07107	12.6900	757.413	18724.7	23699.4	170.812	68.15	95.00	1547
260.000	13.904	.07192	11.9871	719.571	19633.9	24668.3	174.624	69.44	96.29	1504
270.000	13.738	.07279	11.3348	684.171	20554.1	25649.4	178.338	70.80	97.67	1462
280.000	13.573	.07368	10.7284	651.010	21484.8	26642.0	181.957	72.25	99.12	1423
290.000	13.409	.07458	10.1636	619.915	22425.4	27645.9	185.488	73.77	100.65	1384
300.000	13.245	.07550	9.6365	590.740	23376.2	28661.2	188.936	75.36	102.24	1348
310.000	13.082	.07644	9.1438	563.359	24337.9	29688.6	192.310	77.01	103.90	1312
320.000	12.921	.07740	8.6827	537.662	25312.0	30729.8	195.619	78.72	105.59	1278
330.000	12.759	.07837	8.2505	513.553	26300.6	31786.8	198.876	80.44	107.30	1246
340.000	12.599	.07937	7.8449	490.949	27306.1	32862.0	202.089	82.12	108.97	1215
350.000	12.440	.08039	7.4639	469.772	28330.3	33957.3	205.268	83.64	110.46	1186
360.000	12.281	.08142	7.1056	449.953	29372.7	35072.4	208.413	85.00	111.79	1158
370.000	12.124	.08248	6.7685	431.428	30431.0	36204.7	211.500	87.47	114.20	1130
380.000	11.968	.08356	6.4510	414.135	31509.6	37358.6	214.577	89.96	116.62	1103
390.000	11.813	.08466	6.1519	398.009	32610.8	38536.8	217.637	92.37	118.94	1078
400.000	11.659	.08577	5.8700	382.998	33730.9	39735.0	220.671	94.04	120.52	1055
410.000	11.506	.08691	5.6042	369.041	34871.6	40955.4	223.684	97.22	123.57	1031
420.000	11.355	.08807	5.3535	356.081	36031.2	42195.9	226.673	98.34	124.56	1011
430.000	11.205	.08924	5.1171	344.059	37199.9	43446.9	229.617	99.60	125.66	992
440.000	11.058	.09044	4.8941	332.919	38378.8	44709.3	232.519	100.94	126.83	973
450.000	10.911	.09165	4.6838	322.603	39568.4	45983.7	235.383	102.35	128.05	956
460.000	10.767	.09288	4.4855	313.055	40769.2	47270.4	238.211	103.79	129.29	940
470.000	10.625	.09412	4.2983	304.221	41981.3	48569.6	241.005	105.27	130.55	924
480.000	10.485	.09538	4.1218	296.046	43205.0	49881.5	243.767	106.76	131.82	910
490.000	10.346	.09665	3.9553	288.479	44440.3	51206.0	246.498	108.26	133.08	896
500.000	10.210	.09794	3.7982	281.471	45687.4	52543.1	249.199	109.77	134.35	883
520.000	9.945	.10055	3.5101	268.951	48216.5	55255.3	254.517	112.78	136.87	860
540.000	9.688	.10322	3.2532	258.152	50792.5	58017.6	259.730	115.77	139.36	839
560.000	9.441	.10592	3.0238	248.794	53414.9	60829.4	264.842	118.73	141.82	820
580.000	9.202	.10867	2.8186	240.644	56083.3	63690.2	269.861	121.64	144.25	804
600.000	8.972	.11145	2.6345	233.523	58797.3	66599.2	274.792	124.49	146.64	789
620.000	8.751	.11427	2.4690	227.284	61556.3	69555.5	279.639	127.28	148.99	776
640.000	8.538	.11713	2.3196	221.818	64359.5	72558.5	284.406	130.00	151.30	765
660.000	8.332	.12001	2.1845	217.041	67206.2	75607.3	289.096	132.65	153.56	754
680.000	8.135	.12293	2.0619	212.887	70095.5	78700.3	293.743	135.24	155.76	745
700.000	7.945	.12587	1.9503	209.302	73026.6	81837.2	298.259	137.76	157.92	737

# Appendix C. Computer Programs

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PROGRAM POTHERM5 (INPUT,OUTPUT)
C PROPANE THERMOFUNCTIONS, STARTING OCTOBER 1, 1976.
C POTHERM5 REVISED JAN. 25, 1977. PATH FOR COMPR.LIQ. AT T L.T. B.P.
C NOTE USE OF QVAP ,DATA, TO CROSS THE ,DOME,.
C NOTE USE OF CSAT ,DATA, FOR SPECIFIC HEATS IN COMPRESSED LIQUID.
COMMON GK,GKK, B1,B2,B3,B4, E1,ER
COMMON/1/AL,8E,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSOR,OTHOR
COMMON/4/ XB1,XB2, XE1,XE2, OXBDR, DXEDR
COMMON/5/ DDSOT
COMMON/6/ TSAT, THETA, PSAT
COMMON/7/TA,TB,PB, EA,HA,SA, HB,SB, TY1,TY2, DYH,DYS
COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
COMMON/9/ DNG,EG,HG,SG, CVG,CPG,WG, DPGDT,DPGDD
COMMON/10/ DY(40),HY(40),EY(40), SY(40),CPY(40),CVY(40)
COMMON/11/ DK(40),EK(40), SK(40),CVK(40)
COMMON/12/ DELS, DELCV
COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
DIMENSION PP(99)
1 FORMAT(I5, 2F10.0)
2 FORMAT(I5, 3F10.0)
5 FORMAT(1X)
9 FORMAT(8F10.0)
10 FORMAT(1H1 9X *PROPANE FUNCTIONS AT POINT (TB,PB) * //
1 10X 3HT =F8.3, 5H, P =F10.5, 7H, DEN =F8.4//
2 10X 4HEZ =F11.3, 5H, E =F11.3//
3 10X 4HHZ =F11.3, 5H, H =F11.3//
4 10X 4HSZ =F11.5, 5H, S =F11.5//
5 10X 5HCVZ =F10.3, 6H, CV =F10.3//
6 10X 5HCPZ =F10.3, 6H, CP =F10.3//
7 10X 21HYE SAVAGE VALUE, CP =F10.3)
11 FORMAT(1H0 / 12X *FOR SAT.LIQ. AT THE BOILING POINT* //
1 12X4HTA =F10.5/ 12X4HEA =F10.3/ 12X4HHA =F10.3/ 12X4HSA =F10.5)
12 FORMAT(1H1 11X *LOOP CLOSURE FOR SATURATED VAPOR, * /
1 12X *HL,SL VIA PATH TA AND CSAT. Q,VAP VIA CLAPEYRON, * /
2 12X *HG,SG VIA IDEAL GAS AND EQNSTATE, JOULES,MOLES,KELVINS.*//
3 12X 3HT,K 6X4HCSAT 8X2HHL 8X2HSL 5X5HQ,VAP 6X4HHL+Q
4 8X2HHG 6X4HDIFF 4X6HSL+Q/T 8X2HSG 6X4HDIFF )
13 FORMAT(5X 2F10.2, F10.1, F10.3, 4F10.1, 3F10.3)
14 FORMAT(1H1 18X *PROPANE ISOBAR AT P =* F8.5, 4H BAR /)
15 FORMAT(1H1 18X *PROPANE ISOBAR AT P =* I4, 4H BAR /)
16 FORMAT(19X 1HT 6X3HDEN 6X3HVOL 5X5HDP/DT 5X5HDP/DD
2 8X1HE 8X1HH 8X1HS 6X2HCV 6X2HCP 5X1HW /
3 15X 5HDEG K 4X5HMOL/L 4X5HL/MOL 5X5HBAR/K 1X9HBAR-L/MOL 4X5HJ/MOL
4 4X5HJ/MOL 2X7HJ/MOL/K 1X7HJ/MOL/K 1X7HJ/MOL/K 1X5HM/SEC )
17 FORMAT(10X F10.3, F9.3, F9.5, F10.4, F10.3, 2F9.1,F9.3,2F8.2,I6)
18 FORMAT(10X F10.3, F9.5, F9.3, F10.6, F10.3, 2F9.1,F9.3,2F8.2,I6)
C
C CONSTANTS, EQNSTATE MARK-II, DEC. 12, 1976.
C NOTE EZZ ESTIM. FROM STEARNS AND GEORGE.
29 Q = 1.01325 $ TB = 405.0 $ PB = 103.42135
30 WM = 44.09721 $ WK = 100000/WM $ GKK = 0.0831434
31 TTRP = 85.47 $ DTRP = 16.62 $ PTRP = 3.0E-9
32 TCRT = 369.8 $ DCRT = 4.960 $ PCRT = PSATF(TCRT)
33 DGAT = PTRP/GKK/TTRP $ GK = GKK*DCRT $ EZZ = 27452.0
34 AL=1.0 $ BE=0 $ GA=0.06 $ DE=0.75 $ ER=2.0
35 B1 = 0.22566372605 $ B2 = 1.04646227554 $ B3 = -0.44491000068

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Appendix C. Continued.

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36 B4 = 0.12708270211 $ Ci = -0.59883339489
C 37 CALL PEEK $ CALL ISOTHERM $ CALL DEBUGIT
C
C INTEGRATE ON ISOTHERM TB UP TO POINT (TB,PB), THEN -
C COMPARE YESAVAGE CP. PRINT HB, SB, AND ALL VALUES FOR TEST.
40 T = TB $ P = PB $ CALL GENEOS $ CPX = CPXF(T)
41 OB = DEN $ EB = E $ HB = H $ SB = S
46 PRINT 10, T,PB,DB, EZ,E, HZ,HB, SZ,SB, CVZ,CV, CPZ,CP,CPX
49 CALL MEMOBAR $ CALL MEMOSAT
C
C ESTABLISH TA,EA,HA,SA FOR LIQUID AT THE BOILING POINT.
58 TA = T = FINDTSF(Q) $ CALL COEXIST $ EA=E $ HA=H $ SA=S
59 PRINT 11, TA, EA,HA,SA
C 60 CALL CVTEST $ CALL JTLOCUS
C LOOP-CLOSURE EXAM. FOR SATURATED VAPOR.
70 PRINT 12 $ DO 79 J=1,31 $ IF(J.EQ.1) 71,72
71 T = TTRP $ GO TO 75
72 IF(J.EQ.31) 73,74
73 T = TA $ GO TO 75
74 T = 80 + 5*J
75 CALL COHABIT $ CS = CSAT $ HL = H $ SL = S
76 DG=DENGASF(T) $ DL=DENLIQF(T) $ PS=PSATF(T)
77 QV = 100*T*OPSDT*(1/DG - 1/DL)
78 HQ=HL+QV $ DH=HQ-HG $ SQ=SL+QV/T $ DS=SQ-SG
79 PRINT 13, T,CS, HL,SL,QV, HQ,HG,DH, SQ,SG,OS
80 CALL PRINTIT $ CALL TABLIQ
C
C COMPUTE THERMOFUNCTIONS ON ISOBARS. START ON THE MELTING LINE.
C ADD 5 YESAVAGE PRESSURES TO DATA DECK, FOR PLOT.
C ISOBARS AT P UNDER PCRT TRAVERSE THE DOME.
C NOTE USE OF CSAT ,DATA, FOR SP.HEATS OF THE COMPR. LIQUIO.
90 IN = 1 $ NI = 51 $ READ 9, (PP(I),I=1,NI)
91 DO 300 I=IN,NI $ IK = I $ IP = P = PP(I)
92 IF(P-IP) 93,94
93 PRINT 14, P $ GO TO 95
94 PRINT 15, IP
95 PRINT 16
100 T = FINDTMF(P) $ CALL COMLIQ $ V=1/DEN $ IW=W
101 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW
102 IT = T/10 $ IF(P.LT.PCRT) 110,180
C
C CASES FOR P LESS THAN PCRT.
110 TS = FINDTSF(P) $ TX = TS + 10 $ K = L = 0
111 DO 150 J=1,99 $ T = JT = 10*(IT+J)
112 IF(T.LT.TS) 113,117
113 IF(T.LT.TA) 114,115
114 CALL COMLIQ $ V=1/DEN $ IW=W $ GO TO 116
115 CALL COMPLQ $ V=1/OEN $ IW=W
116 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW $ GO TO 150
117 IF(T.LT.TX) 120,130
C CASE FOR SATURATED LIQUID AND VAPOR.
120 T = TS $ IF(T.LT.TA) 121,122
121 CALL COHABIT $ GO TO 123
122 CALL COEXIST
123 V=1/DEN $ VG=1/DNG $ IW=W $ IWG=HG
124 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW $ PRINT 5
125 IF(P.LT.22) 126,127

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Appendix C. Continued.

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126 PRINT 18, T,DNG,VG,DPGDT,DPGDD, EG,HG,SG,CVG,CPG,IWG $ GOTO 128
127 PRINT 17, T,DNG,VG,DPGDT,DPGDD, EG,HG,SG,CVG,CPG,IWG
128 T = JT
C   CASES FOR THE HOMOGENEOUS DOMAIN.
130 IF(JT.GT.500) 131,132
131 K = K+1 $ T = JT = JT + 10*K $ IF(JT.GT.700) 300,132
132 CALL GENIUS $ V = 1/DEN $ IW = W
133 IF(P.LT.22) 134,135
134 PRINT 18, T,DEN,V,DPDT,DPDD, E,H,S, CV,CP,IW $ GO TO 150
135 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S, CV,CP,IW
150 CONTINUE
C
C   CASES FOR P GREATER THAN PCRT. THREE SUBCASES -
180 K=L=0 $ DO 250 J=1,99 $ T = JT = 10*(IT+J)
181 IF(T.LT.TCRT) 190,182
182 IF(T.LT.TB) 200,210
C   CASE A FOR T LESS THAN TCRT.
190 IF(T.LT.TA) 191,192
191 CALL COMLIQ $ V=1/DEN $ IW=W $ GO TO 193
192 CALL COMPLQ $ V=1/DEN $ IW=W
193 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW $ GO TO 250
C   CASE B FOR T.GT.TCRT.AND.T.LT.TB.
C   USE YESAVERAGE AT DEN ABOVE DCRT, USE GENIUS AT DEN UNDER DCRT.
200 PX = PVTf(T,DCRT,0) $ IF(P.GT.PX) 201,220
201 CALL LIQTHRM $ V=1/DEN $ IW=W
202 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW $ GO TO 250
C   CASE C FOR T GREATER THAN TB, THE HOMOGENEOUS DOMAIN.
210 IF(JT.GT.500) 211,220
211 K = K+1 $ T = JT = JT + 10*K $ IF(JT.GT.700) 300,220
220 CALL GENIUS $ V = 1/DEN $ IW = W
221 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW
250 CONTINUE
300 CONTINUE
310 CALL JTLOCUS $ CALL ERNST $ CALL YESAVAS
311 CALL RAO $ CALL LACAM
999 STOP $ END

SUBROUTINE COHABIT
C   GIVEN T AT COEXISTENCE, GET VAPOR+LIQUID PROPERTIES AT T.LT.B.P.
C   FOR VAPOR, GET DNG,EG,HG,SG, CVG,CPG,WG, DPGDT,DPGDD, -
C   FOR LIQUID, GET DEN,E,H,S, CV,CP,W.
COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSOR,DTHOR
COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
COMMON/9/DNG,EG,HG,SG, CVG,CPG,WG, DPGDT,DPGDD
COMMON/12/ DELS, DELCV
COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
DATA (Q=1.01325),(G=0.0831434)
1 PS = PSATf(T) $ ONG = DB = DENGASF(T)
2 TI = T $ CALL IDEAL $ N = DB*20 + 10
3 EG = EZZ + EZ + EDELF(1,N,T,0,DB) $ HG = EG + 100*PS/DB
4 SG = SZ + DELS - 100*G*ALOG(G*T*DB/Q)
5 CVG = CVZ + DELCV $ PX = PVTf(T,DB,1) $ DPGDT=DPDT $ DPGDD=DPDD
6 CPG = CVG + 100*T/DPDD*(DPDT/DB)**2 $ WG = SQRT(WK*CPG*DPDD/CVG)
9 CALL CSATSUM $ RETURN $ END

```

Appendix C. Continued.

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      SUBROUTINE COEXIST
C     GIVEN T AT COEXISTENCE, GET BOTH VAPOR AND LIQUID FUNCTIONS.
C     FOR VAPOR, GET  DNG,EG,HG,SG, CVG,CPG, WG, DPGDT,DPGDD, -
C     FOR LIQUID, GET  DEN,E,H,S, CV,CP,CSAT,W.
C     COEXIST CALLED BY COMRLQ. P NOT USED, MUST NOT CHANGE.
      COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/5/ DDSDT
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/9/DNG,EG,HG,SG, CVG,CPG, WG, DPGDT,DPGDD
      COMMON/12/ DELS, DELCV
      COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DATA (Q=1.01325),(G=0.0831434)
1     FORMAT(1H0 9X *T EXCEEDS TCRT IN COEXIST. * / )
2     IF(T.GT.TCRT) 3,4
3     PRINT 1 $ STOP
4     PS = PSATF(T) $ DNG = DB = DENGASF(T)
5     TI = T $ CALL IDEAL $ N = DB*20 + 10
6     EG = EZZ + EZ + EELF(1,N,T,0,DB) $ HG = EG + 100*PS/DB
7     SG = SZ + DELS - 100*G*ALOG(G*T*DB/Q)
8     IF(T.EQ.TCRT) 9,11
9     PX = PVTf(T,DB,1) $ DPGDT = DPDT $ DPGDD = DPDD
10    CPG = CVG = WG = 0 $ GO TO 15
11    CVG = CVZ + DELCV $ PX = PVTf(T,DB,1)
12    CPG = CVG + 100*T/DPDD*(DPDT/DB)**2 $ WG = SQRT(WK*CPG*DPDD/CVG)
13    DPGDT = DPDT $ DPGDD = DPDD
C     NOW TRAVERSE THE ,DOME, USING QVAP ,DATA,.
15    DEN = DL = DENLIQF(T) $ DDLOT = DDSDT $ QV = QVAPXF(T)
16    H = HG - QV $ S = SG - QV/T $ E = H - 100*PS/DL
17    IF(T.EQ.TCRT) 18,19
18    PX = PVTf(T,DL,1) $ CP=CV=CSAT=W=0 $ RETURN
19    CSAT = CSATXF(T) $ PX = PVTf(T,DL,1)
20    CV = CSAT + 100*T*DPDT*DDLOT/DL/DL
21    CP = CV + 100*T/DPDD*(DPDT/DL)**2
22    W = SQRT(WK*CP*DPDD/CV) $ RETURN $ END

      SUBROUTINE COMLIQ
C     GIVEN P,T FOR COMPRESSED LIQUID, GET DEN ETC. AT T.LT.B.P.
C     FIRST INTEGRATE VIA CSATSUM FROM TA DOWN TO T,
C     THEN INTEGRATE ALONG ISOTHERM T FROM SATLIQ UP TO P.
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/12/ DELS, DELCV
1     CALL CSATSUM $ DA = DEN $ DEN = DB = FINDENF(T,P)
2     DX = DB-DA $ IF(DX) 9,9,3
3     N = DX*10 + 5 $ E = E + EELF(0,N,T,DA,DB)
4     H = E + 100*P/DB $ S = S + DELS $ CV = CV + DELCV
5     PX = PVTf(T,DB,1) $ CP = CV + 100*T/DPDD*(DPDT/DB)**2
6     W = SQRT(WK*CP*DPDD/CV)
9     RETURN $ END

```

Appendix C. Continued.

```

      SUBROUTINE COMPRQ
C      GIVEN P,T FOR COMPRESSED LIQUID AT T,LT,TC, GET DEN, FUNCTIONS.
C      IF T = MULTIPL. 10 K, START WITH DK,EK,SK,CVK ON SATDLIQ.,
C      OTHERWISE, USE COEXIST FOR START ON THE SATDLIQ., AND -
C      FINALLY, INTEGRATE ALONG ISOTHERM T FROM SATLIQ. TO POINT (P,T).
      COMMON/3/DPDT,D2PDT2,DPSDT,OPMDT,OPDD,DPDR,OTSOR,OTHDR
      COMMON/5/ DSDST
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,HK
      COMMON/11/ DK(40),EK(40), SK(40),CVK(40)
      COMMON/12/ DELS, DELCV
      DATA (TCRT = 369.8)
1     FORMAT(1H0 9X *T NOT UNDER TCRT IN COMPRQ. * / )
2     IF(T.LT.TCRT) 4,3
3     PRINT 1      $      STOP
4     I = T/10      $      IF(T-10*I) 5,6
5     CALL COEXIST $ DA = DEN $ GO TO 10
6     DA=DK(I) $ E=EK(I) $ S=SK(I) $ CV=CVK(I)
C     NOW INTEGRATE ALONG ISOTHERM T UP TO POINT (T,P).
10    DEN = DB = FINDENF(T,P) $ DX = DB-DA $ IF(DX) 13,13,11
11    N = DX*10 + 5 $ E = E + EDEL(0,N,T,DA,DB)
12    S = S + DELS $ CV = CV + DELCV
13    H = E + 100*P/DB $ PX = PVT(T,DB,1)
14    CP = CV + 100*T/DPDD*(DPDT/DB)**2
15    W = SQRT(WK*CP*DPDD/CV) $ RETURN $ END

```

```

      SUBROUTINE CPSUMIT
C      USE YESAVAGE CPXF(T) ALONG ISOBAR PB = 103.42135 BAR.
C      INTEGRATE FROM TY1 TO TY2. YIELDS DELTA-H, DELTA-S.
      COMMON/7/TA,TB,PB, EA,HA,SA, HB,SB, TY1,TY2, DYH,DYS
1     TR = TY2 - TY1 $ DYH = DYS = 0 $ IF(TR) 2,6
2     N = ABS(TR)/2 + 2 $ DT = TR/N
3     DO 5 J=1,N $ TJ = TY1 + (J-0.5)*DT $ C = CPXF(TJ)
4     DYH = DYH + C*DT $ DYS = DYS + C*DT/TJ
5     CONTINUE $ RETURN
6     RETURN $ END

```

```

      FUNCTION CPXF(T)
C      PROPANE CP(T), J/MOL/K, YESAVAGE(1500 PSI), 103.42135 BAR.
C      VIA PROGRAM SAVAGE, SEPT. 27, 1976 AT 9.44.
C      DEFINE X ≡ (T-TT)/(TM-TT), WHEN THE EQUATION IS -
C      CP = A1 + A2*X2 + A3*X3 + . . . + A7*X7.
      DIMENSION A(9)
      DATA (TT=85.47),(TM=405.0),(TN=319.53)
      DATA(A = 83.7, 719.296, -7767.049, 40574.6955, -118438.853,
1     205520.887, -210152.230, 116726.413, -27098.492)
1     FORMAT(1H0 9X *T EXCEEDS TB IN CPXF(T).*/ )
2     IF(T.GT.TM) 3,4
3     PRINT 1      $      STOP
4     X = (T-TT)/TN $ S = A(1) $ DO 5 J=2,9
5     S = S + A(J)*X**J $ CPXF = S $ RETURN $ END

```



Appendix C. Continued.

```

      SUBROUTINE CSATSUM
C     FOR SATLIQ START WITH EA,SA AT TA, INTEGRATE FROM TA TO T.
C     YIELDS OEN,E,H,S,CV,CP,CSAT,W AT T FOR THE SATDLIQUIO.
      COMMON/3/OPDT,D2PDT2,DPSDT,OPMDT,OPDO,DPDR,OTSDR,DTHDP
      COMMON/5/ DSDOT
      COMMON/7/TA,TB,PB, EA,HA,SA, HB,SB, TY1,TY2, DYH,DYS
      COMMON/8/ IN,IK, P,T,OEN, E,H,S, CV,CP,CSAT, W,WK
1     E = EA $ S = SA $ TR = T - TA $ IF(TR) 2,9
2     N = ABS(TR)/4 + 2 $ DT = TR/N
3     O 8 J=1,N $ TJ = TA + (J-0.5)*DT
4     C = CSATXF(TJ) $ S = S + C*DT/TJ $ PS = PSATF(TJ)
5     D = DENLIQF(TJ) $ DD = DSDOT*DT
6     E = E + C*DT + 100*PS*DO/D/D
8     CONTINUE
9     CSAT = CSATXF(T) $ OEN = DL = DENLIQF(T) $ DOLDT = DSDOT
10    PS = PVTF(T,DL,1) $ H = E + 100*PS/DL
11    CV = CSAT + 100*T*DPDT*DOLDT/DL/DL
12    CP = CV + 100*T/OPDO*(OPDT/OL)**2
15    W = SQRT(WK*CP*OPDO/CV) $ RETURN $ END

      FUNCTION CSATXF(T)
C     VIA PROGRAM CSAT-C3, OEC. 15, 1976, AT 11.18, USING -
C     DATA FROM POTHERM4, DEC. 13, 1976, AT 10.31.
C     CS = A*X/(1-X)**EP + B + C*X + D*X2 + E*X3, X ≡ T/TCRT.
      DATA(EP=0.8),(TCRT=369.8),(A=4.201410),(B=79.737878),
1     (C=18.313347),(D=-36.564448),(E=67.003225)
2     IF(T.LT.TCRT) 2,9
3     X = T/TCRT $ X2 = X*X $ Q = (1-X)**EP
4     CSATXF = A*X/Q + B + C*X + D*X2 + E*X*X2 $ RETURN
9     CSATXF = 0 $ RETURN $ END

      FUNCTION CUBERT(X)
C     CUBE ROOT MISSING FROM 6600 COMPUTER LIBRARY.
1     E = 1.0/3.0 $ IF(X) 2,3,4
2     CUBERT = -ABS(X)**E $ RETURN
3     CUBERT = 0.0 $ RETURN
4     CUBERT = X**E $ RETURN $ END

      SUBROUTINE CVTEST
C     EXAMINE CV(T) ALONG THE CRITICAL ISOCHORE.
C     DEFINE X ≡ (T/TC-1), Y ≡ (CV-CVZ)/R.
      COMMON/12/ DELS, DELCV
      COMMON/99/TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DATA (OCRT=4.96),(TCRT=369.8),(R=8.31434)
1     FORMAT(1H1 11X *CV(T), J/MOL/K, ALONG THE CRITICAL ISOCHORE * //
2     1 12X 3HT,K 7X3HCVZ 8X2HCV 9X1HX 9X1HY 5X5HLN(X) 5X5HLN(Y) )
2     FORMAT(5X 7F10.3)
10    PRINT 1 $ DO 20 J=1,51 $ IF(J.EQ.1) 11,12
11    TI = T = 370.5 $ GO TO 13
12    TI = T = 369 + J
13    X = T/TCRT - 1 $ N = 100*EXP(-7.44365*X)
14    CALL IDEAL $ E = EZZ + EZ + EDEL(0,N,T,0,DCRT)
15    CV = CVZ + DELCV $ Y = DELCV/R
16    XL = ALOG(X) $ YL = ALOG(Y)
20    PRINT 2, T, CVZ,CV, X,Y, XL,YL $ RETURN $ END

```

Appendix C. Continued.

```

SUBROUTINE DEBUGIT
C  EXAMINE DP/DD FROM PVTF ALONG ISOTHERMS, ESPEC. AT DCRT.
COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
COMMON/3/DPDT,D2PDT2,DPSDT,OPMDT,OPDD,OPDR,DTSOR,DTHOR
COMMON/4/ XB1,XB2, XE1,XE2, OXBOR, OXEDR
COMMON/6/ TSAT, THETA, PSAT
COMMON/20/ B,BD, E,ED, XB, XE, F1
1  FORMAT(1H1 4X *DEBUG ISOTHERM AT T,K =* F8.3/
1  5X6HTTRP =F6.2, 8H, TCRT =F7.2, 8H, DTRP =F6.2, 8H, DCRT =F5.2//
2  4X3HDEN 6X2HTS 2X5HDSOR 6X2HTH 2X5HOTHOR 5X2HPS 2X5HOPSOT
3  6X1HB 5X2HBD 6X1HE 5X2HED 5X2HXB 2X5HDXBOR
4  5X2HXE 2X5HDXEDR 5X2HF1 3X5HP,BAR 2X5HOP/DD )
2  FORMAT(2XF5.2, F8.3, F7.3, F8.3, F7.3, F8.3, F7.5,
1  9F7.4, F8.3, F7.3)
5  DO 20 I=1,8 $ IF(I.EQ.1) 6,7
6  T = TCRT $ GO TO 8
7  T = 360 + 5*I
8  PRINT 1, T, TTRP,TCRT, DTRP,DCRT
10 DO 20 J=1,25 $ DN = 2.88 + 0.16*J $ P = PVTF(T,DN,1)
15 PRINT 2, DN, TSAT,DTSOR, THETA,DTHOR, PSAT,DPSDT,
1  B,BD, E,ED, XB,DXBOR, XE,DXEDR, F1, P, OPDD
20 CONTINUE $ RETURN $ END

```

```

FUNCTION DELTAF(T,D)
C  GET (T*DP/DT - D*DP/DD) FOR THE J-T INVERSION CURVE.
COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
COMMON/3/DPDT,D2PDT2,DPSDT,OPMDT,OPDD,OPDR,DTSOR,DTHOR
1  IF(T-TCRT) 2,4,4
2  DL = DENLIQF(T) $ IF(D-DL) 3,3,4
3  DELTAF = 1.0E+100 $ RETURN
4  P = PVTF(T,D,1)
5  DE: TAF = ABS (T*DPDT-D*DPDD) $ RETURN $ END

```

```

FUNCTION DENGASF(T)
C  PROPANE SATURATED VAPOR DENSITIES, MOL/LITER.
C  DEN = (DC*TC/T)*EXP(-YNG*Y), YNG = LN(DC*TC/DGAT/TTRP),
C  X = (TC-T)/(TC-TT), U = (TC/T-1)/(TC/TT-1).
C  Y = U + (XE-X)*(A1 + A2*X/XE + A3*X + . . + A6*X4).
COMMON/5/ DSDT
DIMENSION A(6)
DATA (DCRT=4.96),(TTRP=85.47),(TCRT=369.8)
DATA (E=0.35),(DGAT=4.22162614E-10),(YNG=24.65183315)
DATA(A = 0.072453281, 0.170534468, -0.278060163,
1  0.438982342, -0.841080253, 0.405105441)
1  FORMAT(1H0 9X *T EXCEEDS TCRT IN DENGASF(T). * / )
2  IF(TCRT-T) 3,4,5
3  PRINT 1 $ STOP
4  DENGASF = DCRT $ DSDT = 1.0E+10 $ RETURN
5  DCT = DCRT*TCRT $ XN=TCRT-TTRP $ X=(TCRT-T)/XN $ X1T=-1.0/XN
6  UN = TCRT/TTRP + 1 $ U = (TCRT/T-1)/UN $ U1T = -TCRT/UN/T/T
7  XE = X**E $ V = XE - X $ V1 = E*X/X - 1
8  W = A(1) + A(2)*X/XE $ W1 = A(2)*(1-E)/XE
9  DO 10 K=3,6 $ L = K-2 $ XL = X**L $ W = W + A(K)*XL
10 W1 = W1 + A(K)*L*XL/X
11 Y = U + V*W $ Y1T = U1T + (V*W1 + V1*W)*X1T
12 DENGASF = DCT/T*EXP(-YNG*Y)
15 DSDT = -(YNG*Y1T + 1/T)*DENGASF $ RETURN $ END

```

Appendix C. Continued.

```

      FUNCTION DENLIQF(T)
C     PROPANE SATURATED LIQUID DENSITIES, MOL/LITER.
C     DEN = DCRT + YNL*(X + (XE-X)*Y),    YNL = DTRP-DCRT,
C     Y = A + B*X2 + C*X3,    X = (TC-T)/(TC-TT).
      COMMON/5/ DDSDT
      DATA (TTRP=85.47),(TCRT=369.8),(DCRT=4.96),(DTRP=16.62)
      DATA (E=0.35),(A=0.775396679),(B=-0.167912979),(C=0.081166807)
1     FORMAT(1H0 9X *T EXCEEDS TCRT IN DENLIQF(T). * / )
2     IF(TCRT-T) 3,4,5
3     PRINT 1 $ STOP
4     DENLIQF = DCRT $ DDSDT = -1.0E+10 $ RETJRN
5     XN = TCRT-TTRP $ X = (TCRT-T)/XN $ X2 = X*X $ X1T = -1.0/XN
6     XE = X**E $ V = XE-X $ V1 = E*X/X - 1 $ YNL = DTRP-DCRT
7     Y = A + B*X2 + C*X*X2 $ Y1 = 2*B*X + 3*C*X2
8     DENLIQF = DCRT + YNL*(X + V*Y)
9     DDSDT = YNL*(1 + V*Y1 + V1*Y)*X1T $ RETURN $ END

      FUNCTION EDELFF(L,N,T,DA,DB)
C     GET CHANGE OF E,S,CV WITH DENSITY ALONG ISOTHERMS.
C     GET EDELFF, DELS, DELCV FROM DA TO DB ALONG ISOTHERM T.
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,OTHDR
      COMMON/12/ DELS, DELCV
      DATA (G = 0.0831434)
1     DX = (DB-DA)/N $ IF(DX) 2,10
2     E = S = CV = 0 $ DO 9 J=1,N $ DN = DA + (J-0.5)*DX
3     DXN = DX/DN/DN $ P = PVTFF(T,DN,0)
4     E = E + (P-T*DPDT)*DXN $ CV = CV - D2PDT2*DXN
5     IF(L.EQ.0) 6,7
6     S = S - DPDT*DXN $ GO TO 9
7     S = S + (G-DPDT/DN)*DX/DN
9     CONTINUE $ EDELFF=100*E $ DELS=100*S $ DELCV=100*T*CV $ RETURN
10    EDELFF = DELS = DELCV = 0 $ RETURN $ END

      SUBROUTINE ERNST
C     G.ERNST/J.BUESSER, J. CHEM. THERMODYN. 2, 787 (1970):
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DIMENSION TC(4), PK(11), C(4,11)
      DATA (TZ=273.15),(Q=0.980665)
1     FORMAT(10X 4F10.0)
2     FORMAT(5F10.0)
3     FORMAT(1H19X*ERNST PROPANE CP(T,P), J/MOL/K, ALONG ISOTHERMS * )
4     FORMAT(1H0 9X *THE ISOTHERM AT T=* F7.2, 2H K /
      1 10X5HP,8AR 2X5HMOL/L 2X5HCP(P) 2X5HCALCD 2X4HPCNT
      2 2X6HCP-CPZ 2X5HCALCD 3X4HDIFF )
5     FORMAT(8X 2F7.3, 2F7.2, F6.2, F8.2, 2F7.2)
6     FORMAT(1H0 8X 4HNP =I3, 9H, AVPCT =F4.2, 9H, AVDIF =F4.2)
C     INDEX I FOR ISOTHERMS. INDEX J FOR PRESSURES.
7     READ 1, (TC(I),I=1,4) $ DO 9 J=1,11
8     READ 2, PK(J),(C(I,J),I=1,4) $ PRINT 3 $ SD = SS = NP = 0
10    DO 30 I=1,4 $ T = TZ + TC(I) $ PRINT 4, T $ CPXZ = C(I,1)
12    DO 20 J=1,11 $ P = Q*PK(J) $ CPX = C(I,J) $ IF(CPX) 13,20
13    NP = NP+1 $ CALL GENEUS $ CPC = CP
14    PCT = 100*(CPX/CPC-1) $ SS = SS + ABS(PCT)
15    DCPX = CPX - CPXZ $ DCPC = CPC - CPZ
16    DIF = DCPX - DCPC $ SD = SD + ABS(DIF)
19    PRINT 5, P,DEN, CPX,CPC,PCT, DCPX,DCPC,DIF
20    CONTINUE
30    CONTINUE $ SS = SS/NP $ SD = SD/NP
31    PRINT 6, NP, SS, SD $ RETURN $ END

```

Appendix C. Continued.

```

FUNCTION FINDENF(T,P)
C  ON ISOTHERM T, FIND DEN, MDL/L, TO MINIMIZE (P-PC) VIA EQNSTATE.
COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,OTHDR
DATA (DM=17.2),(GKK=0.0831434)
41 FDMAT(1H0 9X *FINDENF = 0, FAILS TO CONVERGE. * / )
42 FDMAT(1H0 9X *FINDENF = DCRT, DP/DR ZERO OR NEG. * / )
43 FDMAT(1H0 9X *FINDENF = 0, DOUBLE-VALUED AT P = PSAT. * / )
IF(P.GT.0) 1,35
1 IF(T-TCRT) 2,5,8
2 DG=DENGASF(T) $ DL=DENLIQF(T) $ PS=PSATF(T) $ IF(P-PS) 3,32,4
3 D = DG/2 $ GO TO 11
4 D = (DL+DTRP)/2 $ GO TO 11
5 DG=DL+DCRT $ PS=PCRT $ IF(P-PS) 6,33,7
6 D = DCRT/2 $ GO TO 11
7 D = 2*DCRT $ GO TO 11
8 IF(T.LT.400.0) 9,10
9 PC = PVTf(T,DCRT,0) $ IF(P-PC) 6,33,7
10 D = DCRT
11 DD 30 J=1,50 $ DP=P-PVTf(T,D,1) $ IF(ABS (DP/P)-1.0E-6) 31,31,12
12 IF(DPDD.GT.0) 13,34
13 DD = DP/DPDD $ IF(ABS (DD/D)-1.0E-6) 31,31,14
14 D = D + DD $ IF(D.GT.0.0) 16,15
15 D = P/GKK/T $ GO TO 30
16 IF(D.GT.DM) 17,18
17 D = DM $ GO TO 30
18 IF(T-TCRT) 19,24,30
19 IF(P.LT.PS) 20,22
20 IF(D.GT.DG) 21,30
21 D = DG $ GO TO 30
22 IF(D.LT.DL) 23,30
23 D = DL $ GO TO 30
24 IF(P.LT.PCRT) 25,27
25 IF(D.LT.DCRT) 30,26
26 D = DCRT - 0.02 $ GO TO 30
27 IF(D.GT.DCRT) 30,28
28 D = DCRT + 0.02
30 CONTINUE $ PRINT 41 $ STDP
31 FINDENF = D $ RETURN
32 PRINT 43 $ STDP
33 FINDENF = DCRT $ RETURN
34 FINDENF = DCRT $ PRINT 42 $ RETURN
35 FINDENF=DPDT=D2PDT2=0 $ DPDD=GKK*T $ DPDR=DPDD*DTRP
36 RETURN $ END

```

```

FUNCTION FINDTMF(P)
C  GIVEN P ON THE MELTING LINE, FIND T.
COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
DATA (A=7180.0),(E=1.283)
1 X = (P-PTRP)/A + 1 $ FINDTMF = TTRP*X**{(1.0/E) $ RETURN $ END

```



Appendix C. Continued.

```

      FUNCTION FINDTSF(P)
C     GIVEN VAPOR PRESSURE P, ITERATE T TO MINIMIZE (P-PC).
      COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP, PTRP
      COMMON/3/OPOT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSOR,DTHDR
      1 FORMAT(1H0 9X *FINDTSF = 0, FAILS TO CONVERGE. * / )
      2 FORMAT(1H0 9X *FINOTSF = 0, P EXCEEDS PCRT. * / )
      3 IF(P-PCRT) 4,11,12
      4 T = 250 $ DO 9 J=1,50 $ DP = P - PSATF(T) $ ADP = ABS (DP)
      5 IF(ADP/P-1.0E-6) 10,6,6
      6 IF(ADP/DPSDT/T-1.0E-6) 10,7,7
      7 T = T + OP/DPSDT $ IF(T-TCRT) 9,9,8
      8 T = TCRT
      9 CONTINUE $ PRINT 1 $ STOP
      10 FINDTSF = T $ RETURN
      11 FINOTSF = TCRT $ RETURN
      12 PRINT 2 $ STOP $ END

```

```

      SUBROUTINE GENEIOUS
C     GIVEN P,T FOR THE HOMOGENEOUS DOMAIN -
C     GET DEN AND FUNCTIONS AT ANY TEMPERATURE.
      COMMON/3/OPDT,D2PDT2,DPSOT,DPMDT,DPDD,DPOR,DTSOR,OTHOR
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/12/ OELS, OELCV
      COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DATA (Q=1.01325),(G=0.0831434)
      3 TI = T $ CALL IDEAL $ IF(P.GT.0) 4,10
      4 OEN = DB = FINDENF(T,P) $ N = DB*20 + 10
      5 E = EZZ + EZ + EOELF(1,N,T,0,DB) $ H = E + 100*P/DB
      6 S = SZ + DELS - 100*G*ALOG(G*T*DB/Q)
      7 CV = CVZ + DELCV $ PX = PVTF(T,DB,1)
      8 CP = CV + 100*T/OPDD*(DPDT/DB)**2
      9 W = SQRT(WK*CP*OPDD/CV) $ RETURN
      10 DEN=S/0 $ E = EZZ + EZ $ H = E + 100*G*T $ CV=CVZ $ CP=CPZ
      12 W = SQRT(WK*CP*G*T/CV) $ RETURN $ END

```

```

      SUBROUTINE GENIUS
C     GENIUS SAVES IDEAL GAS VALUES ALONG ISOBARS.
C     SAVE EZK(T), SZK(T), CVZK(T) FROM THE FIRST ISOBAR.
C     GIVEN P,T FOR HOMOGENEOUS DOMAIN, GET DEN AND FUNCTIONS.
C     VALIO ONLY AT INTEGER MULTIPLES OF 10 K.
      COMMON/3/OPOT,D2PDT2,OPSDT,DPMDT,DPDD,DPDR,DTSOR,DTHDR
      COMMON/8/ IN,IK, P,T,OEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/12/ DELS, DELCV
      COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DIMENSION EZK(99), SZK(99), CVZK(99)
      DATA (Q=1.01325),(G=0.0831434)
      1 FORMAT(1H0 9X *T NOT INTEGRAL IN GENIUS. * / )
      2 J = T/10 $ IF(T-10*J) 3,4
      3 PRINT 1 $ STOP
      4 IF(IK.EQ.IN) 5,10
      5 CALL GENEIOUS $ EZK(J) = EZZ + EZ
      6 SZK(J) = SZ $ CVZK(J) = CVZ $ RETURN
      10 DEN = DB = FINDENF(T,P) $ N = DB*20 + 10
      11 E = EZK(J) + EOELF(1,N,T,0,DB) $ H = E + 100*P/DB
      12 S = SZK(J) + DELS - 100*G*ALOG(G*T*DB/Q)
      13 CV = CVZK(J) + DELCV $ PX = PVTF(T,DB,1)
      14 CP = CV + 100*T/DPDD*(DPDT/DB)**2
      15 W = SQRT(WK*CP*OPDD/CV) $ RETURN $ END

```

Appendix C. Continued.

```

SUBROUTINE IDEAL
C  PROPANE IDEAL GAS (1 ATM) THERMOFUNCTIONS VIA CHAO (1973).
C  (HZ-HZZ)/RT = 4.0 + (A + B/Q + C/Q2 + D/X)*EXP(-E/X),  WHERE -
C  X ≡ T/100,    Q ≡ CUBERT(X).
COMMON/99/ TI, EZZ, EZ,SZ, CVZ, HZ, CPZ
DIMENSION A(6)
DATA (E=3.0), (R=8.31434), (SI=32.552)
DATA (A = 24.11012, 94.40550, -585.32814,
1 980.124065, -678.64094, 170.42778)
1 X=TI/100 $ Q=CUBERT(X) $ DQDX=Q/3/X $ XP=EXP(-E/X)
2 H = 4.0 $ SUM = SM1 = 0 $ DO 7 K=1,6
3 H = H + A(K)*XP*Q**(1-K) $ L = 4-K $ QL = Q**L
4 SUM = SUM + A(K)*QL $ SM1 = SM1 + A(K)*L*QL*DQDX/Q
7 CONTINUE $ CP = 4.0 + (E*SUM/X/X + SM1)*XP
C  S = S(300) + INTEGRAL(CP/X)*DX FROM T=300 UP TO TI.
10 N = ABS(TI-300)/4 + 4 $ DX = (X-3)/N $ S = SI
12 DO 20 J=1,N $ X = 3.0 + (J-0.5)*DX $ Q = CUBERT(X)
14 DQDX = Q/3/X $ XP = EXP(-E/X) $ SUM = SM1 = 0
15 DO 19 K=1,6 $ L = 4 - K $ QL = Q**L
16 SUM = SUM + A(K)*QL $ SM1 = SM1 + A(K)*L*QL*DQDX/Q
19 CONTINUE $ CPX = 4.0 + (E*SUM/X/X + SM1)*XP
20 S = S + CPX*DX/X
C  CONVERT TO DIMENSIONED RESULTS, JOULES, MOLES, KELVINS.
22 CPZ = R*CP $ SZ = R*S $ HZ = R*TI*H
23 CVZ = CPZ - R $ EZ = HZ - R*TI $ RETURN $ END

SUBROUTINE ISOTHRM
C  PRINTOUT THE CRITICAL ISOTHERM.
COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,OTHDR
COMMON/4/ XB1,XB2, XE1,XE2, OXBDR, DXEDR
COMMON/6/ TSAT, THETA, PSAT
1 FORMAT(1H1 14X *THE CRITICAL ISOTHERM* //
1 6X4HTC =F7.2, 6H, DC =F5.2, 6H, PC =F11.7,
2 *. AT THE C.P., DPS/DT =* F8.5, 9H, DP/DT =F8.5//
3 6X4HD/DC 9X5HTS/TC 9X5HPS/PC 10X4HP/PC 9X5HDP/DR 4X6HOTS/DR
4 4X6HOTH/DR 4X6HOPS/DR 4X6HDXB/DR 4X6HDXC/DR )
2 FORMAT(2X F8.2, 3F14.10, F14.9, 5F10.5)
3 PC = PVTf(TCRT,DCRT,0)
4 PRINT 1, TCRT,DCRT,PCRT, DPSDT,DPDT $ DO 8 J=1,51
5 DR = 0.74 + 0.01*J $ DN = DR*DCRT
6 PR = PVTf(TCRT,DN,1)/PCRT $ DPSDR = DPSDT*DTSDR
7 TSN = TSAT/TCRT $ PSN = PSAT/PCRT
8 PRINT 2, DR, TSN,PSN, PR,DPDR, DTSDR,OTHDR,DPSDR, OXBDR,DXEDR
9 RETURN $ END

```

```

      SUBROUTINE JTLOCUS
C     DERIVE THE J-T INVERSION CURVE.  USE ROUTINE DELTAF(T,DI).
      COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
      DIMENSION TT(99),PP(99),DN(99)
      DATA (A=2.77755),(B=0.60625),(TZ=500.0)
      1 FORMAT(1H1 16X *THE JOULE-THOMSON INVERSION LOCUS FOR PROPANE*//
      1 17X3HT,K 5X5HP,BAR 5X5HMOL/L 7X3HT,K 5X5HP,BAR 5X5HMOL/L)
      2 FORMAT(10X I10, F10.1, F10.2, I10, F10.1, F10.2)
      5 TA = 290 $ NP = 52
      6 PRINT 1 $ DO 25 I=1,NP $ DX = 1.6
      7 T = TA + 10*I $ U = T/TZ $ DI = EXP(A-B*U)
      10 IF(T-TCRT) 11,12,12
      11 DL = DENLIQF(T) $ IF(DI-DL) 25,12,12
      12 SS = DELTAF(T,DI) $ DO 20 IT=1,18
      14 D=DI-DX $ SL=DELTAF(T,D) $ D=DI+DX $ SP=DELTAF(T,D)
      15 IF(SS-SL) 18,16,16
      16 IF(SP-SL) 19,17,17
      17 SS = SL $ DI = DI - DX $ GO TO 20
      18 IF(SS-SP) 20,20,19
      19 SS = SP $ DI = DI + DX
      20 DX = DX/2
      23 TT(I) = T $ DN(I) = DI $ PP(I) = PVTF(T,DI,0)
      25 CONTINUE $ N = NP/2 $ DO 29 J=1,N
      26 IT = TT(J) $ ITT = TT(J+N)
      29 PRINT 2, IT,PP(J),DN(J), ITT,PP(J+N),DN(J+N)
      30 RETURN $ END

      SUBROUTINE LACAM
C     PROPANE SPEED OF SOUND, LACAM,A.,
C     JOURNAL DES RESCHERCHES DU CNRS 34, 25 (MARCH, 1956). (PARIS).
      COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      DIMENSION TC(8),IPA(25),IWX(8,25)
      DATA (Q=1.01325),(TZ=273.15),(TB=405.0)
      1 FORMAT(8X 8F8.0)
      2 FORMAT(9I8)
      3 FORMAT(1H0// 15X *LACAM PROPANE SPEED OF SOUND AT T,K =* F7.2//
      1 15X 5HP,BAR 5X5HMOL/L 5X5HM/SEC 5X5HCALCD 6X4HPCNT )
      4 FORMAT(10X 2F10.3, 2I10, F10.2)
      5 FORMAT(1H1)
      6 FORMAT(1H0 14X 4HNP = I4, 11H, MEANPCT = F6.2)
C     INDEX I FOR ISOTHERMS. INDEX J FOR PRESSURES.
      8 READ 1, (TC(I),I=1,8) $ DO 9 J=1,25
      9 READ 2, IPA(J), (IWX(I,J),I=1,8) $ SS = NP = 0 $ PRINT 5
C     NOW COMPARE WITH MY RESULTS ALONG ISOTHERMS.
      10 DO 90 I=1,8 $ T = TZ + TC(I) $ PRINT 3, T
      11 IF(T.LT.TCRT) 12,30
C     CASES FOR T LESS THAN TCRT.
      12 PS = PSATF(T)
      13 DO 25 J=1,25 $ P = Q*IPA(J) $ WX = JW = IWX(I,J)
      14 IF(P-PS) 18,25,15
      15 IF(T.LT.361) 16,17
      16 CALL COMPLQ $ GO TO 19
      17 CALL LIQTHRM $ GO TO 19
      18 CALL GENEUS
      19 DIF=WX-W $ PCT=100*DIF/WX $ IW=W $ NP=NP+1 $ SS=SS+ABS(PCT)
      20 PRINT 4, P,DEN, JW,IW, PCT
      25 CONTINUE $ GO TO 90
C     CASES FOR T GREATER THAN TCRT.
      30 DO 40 J=1,25 $ P = Q*IPA(J) $ WX = JW = IWX(I,J)
      31 IF(T.LT.TB) 32,34
      32 PX = PVTF(T,DCRT,0) $ IF(P.GT.PX) 33,34
      33 CALL LIQTHRM $ GO TO 35
      34 CALL GENEUS
      35 DIF=WX-W $ PCT=100*DIF/WX $ IW=W $ NP=NP+1 $ SS=SS+ABS(PCT)
      40 PRINT 4, P,DEN, JW,IW, PCT
      90 CONTINUE $ SS = SS/NP $ PRINT 6, NP, SS
      99 RETURN $ END

```

Appendix C. Continued

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      SUBROUTINE LIQTHRM
C     FOR DEN ABOVE DCRT, AND T UNDER TB = 405 K.
C     GIVEN P,T, GET DEN AND FUNCTIONS.
C     IF T = MULTIPL. 10 K, START WITH DY,EY,SY,CVY ON ISOBAR PB,
C     OTHERWISE, INTEGRATE VIA CPSUMIT ALONG PB TO T, THEN -
C     FINALLY, INTEGRATE ALONG ISOTHERM T TO POINT (P,T).
      COMMON/3/DPDT,D2PDT2,DPSDT,OPMDT,OPDD,OPDR,DTSDR,OTHDR
      COMMON/7/TA,TB,PB, EA,HA,SA, HB,SB, TY1,TY2, DYH,DYS
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,HK
      COMMON/10/ DY(40),HY(40),EY(40), SY(40),CPY(40),CVY(40)
      COMMON/12/ DELS, DELCV
  1  FORMAT(1H0 9X *T EXCEEDS TB IN LIQTHRM. * / )
  2  IF(T.GT.TB) 3,4
  3  PRINT 1 $ STOP
  4  I = T/10 $ IF(T-10*I) 10,5
  5  DA=DY(I) $ E=EY(I) $ S=SY(I) $ CV=CVY(I) $ GO TO 20
 10  IF(I-23) 11,12,12
 11  K = I+1 $ GO TO 13
 12  K = I
 13  TY1 = 10*K $ TY2 = T $ CALL CPSUMIT
 14  H = HY(K) + DYH $ S = SY(K) + DYS $ CP = CPXF(T)
 15  DA = FINDENF(T,PB) $ E = H - 100*PB/DA
 16  CV = CP - 100*T/OPDD*(DPDT/DA)**2
C   NOW INTEGRATE ALONG T FROM ISOBAR PB TO POINT (P,T).
 20  DEN = DB = FINDENF(T,P) $ N = ABS(DB-DA)*5 + 5
 21  E = E + EDEL(0,N,T,DA,DB) $ H = E + 100*P/DB
 22  S = S + DELS $ CV = CV + DELCV
 23  PX = PVTF(T,OB,1) $ CP = CV + 100*T/OPDD*(DPDT/DB)**2
 25  W = SQRT(WK*CP*OPDD/CV) $ RETURN $ END

      SUBROUTINE MEMOBR
C     MEMORIZE FUNCTIONS ALONG ISOBAR PB = 103.42135 BAR.
C     STORE DY,HY,EY,SY,CPY,CVY EVERY 10 K FROM 90 THRU 400 K.
C     START AT TB = 405 K WITH VALUES HB, SB, THEN -
C     USE CPSUMIT FOR DYH, DYS FROM TY1 TO TY2.
      COMMON/3/OPDT,D2PDT2,DPSDT,OPMDT,OPDD,OPDR,DTSDR,OTHDR
      COMMON/7/TA,TB,PB, EA,HA,SA, HB,SB, TY1,TY2, DYH,DYS
      COMMON/10/ DY(40),HY(40),EY(40), SY(40),CPY(40),CVY(40)
C   FIRST, GET VALUES AT 400 K.
  1  TY1 = TB $ J = 40 $ TY2 = TT = 10*J
  2  CALL CPSUMIT $ DY(J) = DN = FINDENF(TT,PB)
  3  HY(J) = HB + DYH $ SY(J) = SB + DYS
  4  EY(J) = HY(J) - 100*PB/DN $ CPY(J) = CPXF(TT)
  5  CVY(J) = CPY(J) - 100*TT/OPDD*(DPDT/DN)**2
C   NOW INTEGRATE FROM 400 K DOWN TO 90 K IN STEPS OF 10 K.
 10  DO 20 J=1,31 $ K = 41 - J $ L = 40 - J
 11  TY1 = 10*K $ TY2 = TT = 10*L $ CALL CPSUMIT
 12  DY(L) = DN = FINDENF(TT,PB)
 13  HY(L) = HY(K) + DYH $ SY(L) = SY(K) + DYS
 14  EY(L) = HY(L) - 100*PB/DN $ CPY(L) = CPXF(TT)
 15  CVY(L) = CPY(L) - 100*TT/OPDD*(DPDT/DN)**2
 20  CONTINUE $ RETURN $ END

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Appendix C. Continued.

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      SUBROUTINE MEMOSAT
C      MEMORIZE FUNCTIONS ON THE SATURATED LIQUID BOUNDARY.
C      STORE DK,EK,SK,CVK EVERY 10 K FROM 90 THRU 360 K.
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/11/ DK(40),EK(40), SK(40),CVK(40)
      1 DO 3 J=9,36 $ T = 10*J $ CALL COEXIST
      2 DK(J)=DEN $ EK(J)=E $ SK(J)=S $ CVK(J)=CV
      3 CONTINUE $ RETURN $ END

      SUBROUTINE PEEK
C      EXAMINE BEHAVIOR OF EQNSTATE COEFFICIENTS.
C      B(R) = B1 + B2*R + B3*R2 + B4*R3,
C      E(R) = E1*(R-1)*(R-ER)*EXP(-GA*R4).
      COMMON GK,GKK, B1,B2,B3,B4, E1,ER
      COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
      COMMON/6/ TSAT, THETA, PSAT
      4 FORMAT(1H1 14X *EQUATION OF STATE, COEFFICIENTS* //
      1 15X 6HDGAT =E15.9/
      2 15X 6HDTRP =F8.4, 8H, TTRP =F8.3, 8H, PTRP =E16.9/
      3 15X 6HDCRT =F8.4, 8H, TCRT =F8.3, 8H, PCRT =F13.9//
      4 15X 4HAL =F5.2, 6H, BE =F5.2, 6H, GA =F6.3, 6H, DE =F6.3,
      5 6H, ER =F5.2// 13X 4F16.11/ 13X F16.11/ )
      5 FORMAT(15X 5HMOL/L 6X4HTSAT 5X5HTHETA 6X4HPSAT 9X1HB 9X1HC )
      6 FORMAT(10X F10.1, 3F10.3, F10.4, F10.5)
      70 PRINT 4, DGAT, DTRP,TTRP,PTRP, DCRT,TCRT,PCRT,
      1 AL,BE,GA,DE,ER, B1,B2,B3,B4, E1
      71 PRINT 5 $ DO 77 J=1,34 $ DN = 0.5*J $ R = S = DN/DCRT
      72 R2 = R*R $ R3 = R*R2 $ SN = S-1 $ SR = S-ER
      73 B = B1 + B2*R + B3*R2 + B4*R3 $ E = E1*SN*SR*EXP(-GA*R2*R2)
      76 TS=TSAT=TSATF(DN) $ TH=THETA F(DN) $ PS=PSATF(TS)
      77 PRINT 6, DN, TS,TH,PS, B,E $ RETURN $ END

      FUNCTION PMELTF(T)
C      PROPANE MELTING LINE, BAR, VIA REEVES, SCOTT, AND BABB(JR),
C      J. CHEM. PHYS. 40(12), 3662 (1964).
      COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
      COMMON/3/DPDT,DPDT2,DPSDT,OPMDT,OPDD,OPDR,OTSDR,OTHOR
      DATA (A = 7180.0),(E = 1.283)
      1 X = T/TTRP $ XE = X**E $ PMELTF = PTRP + A*(XE-1)
      2 OPMOT = A*E*XE/X/TTRP $ RETURN $ END

```

Appendix C. Continued.

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      SUBROUTINE PRINTIT
C      PRINTOUT ISOCHORES AND ISOTHERMS.
      COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPST,DPMT,DPDD,DPDR,DTSDR,DTHDR
      1 FORMAT(I5, 2F10.0)
      6 FORMAT(1H1 16X *THE ISOCHORE AT* F6.2, * MOL/L* //
      1 17X 3HT,K 5X5HP,BAR 5X5HDP/DD 5X5HDP/DT 4X7HD2P/DT2)
      7 FORMAT(10X F10.1, 2F10.3, F10.4, F11.5)
      8 FORMAT(1H1 14X *THE ISOTHERM AT* F7.2, * DEG. K* //
      1 10X 5HMOL/L 5X5HP,BAR 5X5HDP/DD 5X5HDP/DT 5X7HD2P/DT2 )
      9 FORMAT(5X F10.2, 2F10.3, F10.4, F12.6)
C      PRINTOUT THE ISOCHORES.
      30 DO 60 I=1,17 $ IF(I.EQ.5) 31,32
      31 DN = DCRT $ GO TO 38
      32 IF(I.EQ.17) 33,34
      33 DN = DTRP $ GO TO 38
      34 DN = I
      38 PRINT 6, DN
      39 IF(DN-DTRP) 40,41,41
      40 TS = TSATF(DN) $ GO TO 42
      41 TS = TTRP*(DN/DTRP)**4
      42 IF(I-9) 43,43,44
      43 IT = 8 $ GO TO 50
      44 IF(I-11) 45,45,46
      45 IT = 4 $ GO TO 50
      46 IF(I-14) 47,47,48
      47 IT = 2 $ GO TO 50
      48 IT = 1
      50 DO 59 J=86,600,IT $ TT = J $ IF(TT-TS) 59,52,52
      52 PP = PVTFF(TT,DN,1) $ IF(PP.GT.700) 60,58
      58 PRINT 7, TT,PP, DPDD, DPDT, D2PDT2
      59 CONTINUE
      60 CONTINUE
C      PRINTOUT THE ISOTHERMS.
      100 DO 130 I=1,99 $ READ 1, IDD, TT,OX $ IF(IDD) 101,999
      101 PRINT 8, TT $ PM = PMELTF(TT)
      102 IF(TT-TCRT) 103,103,104
      103 DG = DENGASF(TT) $ DL = DENLIQF(TT)
      104 IF(I.LT.14) 105,106
      105 DS = 0.05 $ GO TO 113
      106 IF(I.LT.17) 107,108
      107 DS = 0.10 $ GO TO 113
      108 IF(I.EQ.17) 109,110
      109 DS = 0.20 $ GO TO 113
      110 DS = 0.40
      113 DO 120 N=1,500 $ DN = N*DS $ IF(TT-TCRT) 114,115,115
      114 IF(DN.GT.DG.AND.DN.LT.DL) 120,115
      115 PP = PVTFF(TT,DN,1) $ IF(PP.GT.PM.OR.PP.GT.750) 130,119
      119 PRINT 9, DN,PP, DPDD, DPDT, D2PDT2
      120 CONTINUE
      130 CONTINUE
      999 RETURN $ END

```

Appendix C. Continued.

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      FUNCTION PSATF(T)
C   PROPANE VAPOR PRESSURES, BAR,
C   LN(P/PT) = A*X + (B*U + C*U2 + D*U3)*(1-U)**E.
C   ARGS., U ≡ (T-TT)/(TC-TT), X ≡ (1-TT/T)/(1-TT/TC).
      COMMON/3/DPDT,D2PDT2,DPSDT,OPMDT,OPDD,OPDR,DTSDR,OTHDR
      DATA (E=1.3),(PTRP=3.0E-9),(TTRP=85.47),(TCRT=369.80)
      DATA(A=23.37228380),(B=5.71668788),(C=-8.51170714),(D=3.97587379)
1  FORMAT(1H0 9X *T EXCEEDS TCRT IN PSATF(T). * / )
2  UN = TCRT-TTRP $ U = (T-TTRP)/UN $ U2 = U*U $ U1T = 1.0/UN
3  XN = 1-TTRP/TCRT $ X = (1-TTRP/T)/XN $ X1T = TTRP/XN/T/T
4  V = 1.0 - U $ IF(V) 5,6,7
5  PRINT 1 $ STOP
6  Z = Z1 = 0 $ GO TO 8
7  Z = V**E $ Z1 = -E*Z/V
8  W = B*U + C*U2 + D*U*U2 $ W1 = B + 2*C*U + 3*D*U2
9  F = A*X + W*Z $ F1T = A*X1T + (W*Z1 + W1*Z)*U1T
10 PSATF = PTRP*EXP(F) $ DPSDT = F1T*PSATF $ RETURN $ END

```

```

      FUNCTION PVTf(T,D,M)
C   THE EQUATION OF STATE FOR PROPANE.
C   PVTf = P,BAR. M=0 YIELDS DP/DT, D2P/DT2. M=1 YIELDS ALSO DP/DD.
C   EQNSTATE, P-PSAT = S*GK*(T-TSAT) + S*S*GK*TCRT*F(R,T), WHERE -
C   F(R,T) ≡ B(S)*XBf(R,T) + E(S)*XEF(R,T), AND -
C   B(R) = B1 + B2*R + B3*R2 + B4*R3,
C   E(R) = E1*(R-1)*(R-ER)*EXP(-GA*R4).
      COMMON GK,GKK, B1,B2,B3,B4, E1,ER
      COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,OPMDT,OPDD,OPDR,DTSDR,OTHDR
      COMMON/4/ XB1,XB2, XE1,XE2, DXBDR, DXEDR
      COMMON/6/ TSAT, THETA, PSAT
      COMMON/20/ B,BD, E,ED, XB, XE, F1
      IF(D.GT.0) 1,29
1  R = S = D/DCRT $ R2 = R*R $ R3 = R*R2 $ R4 = R2*R2
2  SN = S - 1 $ SR = S - ER $ TC = TCRT
3  RG = R*GK $ GKT = GK*TC $ DSDR = DTRP/DCRT
5  TS=TSAT=TSATF(D) $ PS=PSAT=PSATF(TS) $ THETA=THETAf(D)
6  XB = XBf(T,D) $ XE = XEF(T,D)
7  B = (B1 + B2*R + B3*R2 + B4*R3)*R2
8  XP = EXP(-GA*R4) $ SM = SN*R2*SR $ E = E1*SM*XP
10 F = B*XB + E*XE $ F1 = B*XB1 + E*XE1
11 F2 = B*XB2 + E*XE2 $ PVTf = PS + RG*(T-TS) + GKT*F
14 DPDT = RG + GK*F1 $ D2PDT2 = GK*F2/TC $ IF(M) 15,30
15 BD = (2*B1*R + 3*B2*R2 + 4*B3*R3 + 5*B4*R4)*DSDR
16 XP1 = -4*GA*R3 $ SM1 = SN*R2 + (3*R-2)*R*SR
17 ED = (SM*XP1 + SM1)*E1*XP*DSDR
20 F1 = B*DXBDR + BD*XB + E*DXEDR + ED*XE
26 OPDR = (DPSDT-RG)*DTSDR + (T-TS)*GK*DSDR + GKT*F1
27 OPDD = OPDR/DTRP $ RETURN
29 PVTf = DPDT = D2PDT2 = 0 $ OPDD = GKK*T $ OPDR = OPDD*DTRP
30 RETURN $ END

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Appendix C. Continued.

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      FUNCTION QVAPXF(T)
C     PROPANE HEATS OF VAPORIZATION, J/MOL. -
C     VIA PROGRAM QVAP-C3, DEC. 15, 1976 AT 14.31, USING -
C     DATA FROM PTHERM4, DEC. 13, 1976 AT 10.31.
C     QVAP/QTRP = X + (XE-X)*(A + B*X/XE + C*X), WHERE -
C     X ≡ (TC-T)/(TC-TT), XE ≡ X**E.
      DATA (E=0.38), (QT=23.906)
      DATA (TTRP=85.47), (TCRT=369.8), (XN=284.33)
      DATA (A=0.98373471), (B=0.41758440), (C=-0.30674140)
1     IF(T.LT.TCRT) 2,5
2     X = (TCRT-T)/XN $ XE = X**E $ S = A + B*X/XE + C*X
3     QVAPXF = QT*1000*(X + (XE-X)*S) $ RETURN
5     QVAPXF = 0 $ RETURN $ END

      SUBROUTINE RAD
C     SPEED OF SOUND FOR SATLIQ PROPANE AT 143 TO 228 K.
C     INDIAN J. PURE/APPLIED PHYS. 9, 169 (MARCH, 1971).
C     HIS FORMULA, W = 2364 - 5.9647*T, METERS/SEC.
      COMMON/8/ IN, IK, P, T, DEN, E, H, S, CV, CP, CSAT, W, WK
      DATA (A=2364.0), (B=5.9647)
3     FORMAT(1H1 16X *RAO PROPANE SPEED OF SOUND FOR SATO. LIQUID**//
1     17X 3HT, K 5X5HMDL/L 5X5HM/SEC 5X5HCALCO 6X4HPCNT )
4     FORMAT(10X 2F10.3, 2I10, F10.2)
6     FORMAT(1H0 14X 4HNP = I4, 11H, MEANPCT = F6.2)
10    PRINT 3 $ SS = 0 $ NP = 19 $ DO 15 J=1, NP
11    T = 135 + 5*J $ IWX = WX = A - B*T
12    CALL CSATSUM $ IW = W
13    DIF=WX-W $ PCT=100*DIF/WX $ SS=SS+ABS(PCT)
14    PRINT 4, T, DEN, IWX, IW, PCT
15    CONTINUE $ SS = SS/NP $ PRINT 6, NP, SS
30    RETURN $ END

      SUBROUTINE SATLQTR
C     GIVEN P, T, FOR SATLIQ, GET DEN AND FUNCTIONS.
C     START WITH DY, EY, SY, CVY ON ISOBAR PB AT MULTIPLES OF 10 K.
C     IF T = MULTIPLE OF 10 K, INTEGRATE ON ISOTHERM T DOWN TO SATLIQ.
C     OTHERWISE, FIRST INTEGRATE ALONG PB VIA CPSUMIT.
      COMMON/3/ DPOT, D2PDT2, DPSOT, OPMOT, OPDD, OPDR, OTSOR, DTHOR
      COMMON/5/ DOSOT
      COMMON/7/ TA, TB, PB, EA, HA, SA, HB, SB, TY1, TY2, DYH, DYS
      COMMON/8/ IN, IK, P, T, DEN, E, H, S, CV, CP, CSAT, W, WK
      COMMON/10/ DY(40), HY(40), EY(40), SY(40), CPY(40), CVY(40)
      COMMON/12/ DELS, DELCV
      DATA (TCRT = 369.80)
1     FORMAT(1H0 9X *T EXCEEDS TCRT IN SATLQTR. * / )
2     IF(T.GT.TCRT) 3,4
3     PRINT 1 $ STOP
4     I = T/10 $ IF(T-10*I) 10,5
5     DA=DY(I) $ E=EY(I) $ S=SY(I) $ CV=CVY(I) $ GO TO 20
10    K = I+1 $ TY1 = 10*K $ TY2 = T $ CALL CPSUMIT
11    H = HY(K) + DYH $ S = SY(K) + DYS $ CP = CPY(K)
12    DA = FINDENF(T, PB) $ E = H - 100*PB/DA
13    CV = CP - 100*T/OPDD*(DPOT/DA)**2
C     NOW INTEGRATE ALONG ISOTHERM T DOWN TO THE SATLIQ.
20    DEN = DB = DENLIQF(T) $ DDLOT = DOSOT $ N = 5*ABS(DB-DA) + 5
21    E = E + EDELFF(0, N, T, DA, DB) $ H = E + 100*P/DB
22    S = S + DELS $ IF(T.LT.TCRT) 24,23
23    CP = CV = CSAT = W = 0 $ RETURN
24    CV = CV + DELCV $ PX = PVTFF(T, DB, 1)
25    CP = CV + 100*T/OPDD*(OPDT/DB)**2
26    CSAT = CV - 100*T*DPDT*DDLOT/DB/DB
30    W = SQRT(WK*CP*OPDD/CV) $ RETURN $ END

```



Appendix C. Continued.

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SUBROUTINE TABLIQ
C   TABULATE THE PROPANE SATURATED LIQUIO FUNCTIONS.
COMMON/1/AL,BE,GA,OE, DCRT,TCRT,PCRT, OGAT, OTRP,TTRP,PTRP
COMMON/3/OPOT,OPOT2,OPSOT,OPMDT,OPPO,OPOR,OTSOR,OTHOR
COMMON/5/ OOSOT
COMMON/7/TA,TB,PB, EA,HA,SA, HB,SB, TY1,TY2, OYH,OYS
COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,HK
COMMON/9/ONG,EG,HG,SG, CVG,CPG,WG, OPGOT,OPG00
DIMENSION TSA(60), PSA(60)
4  FORMAT(1H1 13X *PROPERTIES OF SATURATED LIQUIO PROPANE* //
1  14X1HT 10X1HP 5X3HDEN 3X5HV,LIQ 6X5HV,GAS 5X6HOPS/OT 3X6H0OL/OT
2  4X5HOP/DT 6X5HOP/DD 2X5HQ,VAP /
3  10X 5H0EG K 8X3HBAR 3X5HMOL/L 3X5HL/MOL 6X5HL/MOL 6X5HBAR/K
4  2X7HMOL/L/K 4X5HBAR/K 2X9HBAR-L/MOL 2X5HJ/MOL )
5  FORMAT(5XF10.3, E11.4, F8.3, F8.5, 2E11.4, F9.5, F9.3, E11.4, I7)
11 FORMAT(1H1 13X *PROPERTIES OF SATURATED LIQUIO PROPANE* //
1  14X1HT 11X1HP 9X1HE 9X1HH 9X1HS
2  6X2HCV 6X2HCS 6X2HCP 6X1HW /
3  10X5HDEG K 9X3HBAR 5X5HJ/MOL 5X5HJ/MOL 3X7HJ/MOL/K
4  1X7HJ/MOL/K 1X7HJ/MOL/K 1X7HJ/MOL/K 2X5HM/SEC )
12 FORMAT(5X F10.3, E12.4, 2F10.1, F10.3, 3F8.2, I7)
C   FOR PAGE ONE OF TABLIQ.
C   REPLACE T = 230 BY BOILING-POINT AT J = 30.
130 PRINT 4      $ NP = 58
131 OO 150 J=1,NP $ IF(J.EQ.1) 132,133
132 T = TTRP $ GO TO 139
133 IF(J.EQ.30) 134,135
134 T = FINOTSF(1.01325) $ GO TO 139
135 IF(J.EQ.NP) 136,138
136 T = TCRT $ OG = DL = OCRT $ ODLOT = 0
137 VG = VL = 1.0/DCRT $ GO TO 141
138 T = 80 + 5*J
139 DL = DENLIQF(T) $ OOLOT = DOSDT
140 OG = DENGASF(T) $ VG = 1/OG $ VL = 1/DL
141 TSA(J) = T $ PSA(J) = PS = PSATF(T) $ DPXOT = OPSOT
145 IF(T.LT.TA) 146,147
146 CALL COHABIT $ IQX = HG - H $ GO TO 150
147 PX = PVTf(T,OL,1) $ IQX = QVAPXF(T)
150 PRINT 5, T,PS,OL,VL,VG, DPXOT,DOLOT, OPOT,OPDD, IQX
C   FOR PAGE TWO OF TABLIQ.
C   USE COEXIST AT T UNOER 360 K, USE SATLQTR AT T ≥ 360 K.
160 PRINT 11 $ OO 170 J=1,NP $ P = PSA(J) $ T = TSA(J)
161 IF(T.LT.360) 162,165
162 IF(T.LT.TA) 163,164
163 CALL CSATSUM $ GO TO 166
164 CALL COEXIST $ GO TO 166
165 CALL SATLQTR
166 IW = W
170 PRINT 12, T,P, E,H,S, CV,CSAT,CP, IW
999 RETURN $ ENO

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Appendix C. Continued.

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      FUNCTION THETAF(DEN)
C      THETA = TSAT*EXP(U(S)).
C      LET Q = (S-1)/(ST-1), WHERE ST = DTRP/DCRT, THEN -
C      IF S < 1, U = AL*Q**3, IF S > 1, U = -AL*Q**3,
      COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,OPMDT,OPDD,OPDR,OTSOR,OTHDR
      COMMON/6/ TSAT, THETA, PSAT
1     S = DEN/DCRT $ DSOR = DTRP/DCRT $ C = DSOR-1
2     Q = (S-1)/C $ Q2 = Q*Q $ U = AL*Q*Q2
3     U1 = AL*3*Q2*DSOR/C $ IF(Q) 5,9,4
4     U = -U $ U1 = -U1
5     XP = EXP(U) $ THETAF = TSAT*XP
6     OTHDR = (TSAT*U1 + OTSOR)*XP $ RETURN
9     THETAF = TCRT $ OTHDR = 0 $ RETURN $ END

      SUBROUTINE TSAI
C      COMPARE VAPOR-PRESSURE AND QVAP DATA OF CHENG-HSIUNG TSAI, THESIS,
C      TENN. TECH. INST., COOKEVILLE, TENN., (JUNE, 1971).
      DATA (PA=760.0),(QP=1.01325),(QK=4.184),(WM=44.09721)
1     FORMAT(I5, F10.0, E15.0)
2     FORMAT(I5, 2F10.0)
3     FORMAT(1H1 16X *PROPANE VAPOR PRESSURES OF TSAI * //
      1 17X 3HT,K 7X5HP,BAR 7X5HCALCD 6X4HPCNT )
4     FORMAT(10X F10.2, 2E12.4, F10.2)
5     FORMAT(1H1 16X *PROPANE HEATS OF VAPORIZATION OF TSAI * //
      1 17X 3HT,K 4X6HKJ/MOL 5X5HCALCD 6X4HPCNT )
6     FORMAT(10X F10.2, 2F10.3, F10.2)
10    PRINT 3 $ DO 15 J=1,99
11    READ 1, ID, T, P $ IF(ID) 12,20
12    P = P*QP/PA $ PC = PSATF(T) $ PCT = 100*(P/PC-1)
15    PRINT 4, T, P, PC, PCT
20    PRINT 5 $ DO 25 J=1,99
21    READ 2, ID, T, QV $ IF(ID) 22,30
22    QV = QV*QK*WM/44095 $ QC=QVAPXF(T)/1000 $ PCT = 100*(QV/QC-1)
25    PRINT 6, T, QV, QC, PCT
30    RETURN $ END

```

FOR SAT.LIQ. AT THE BOILING POINT

```

TA = 231.07066
EA = 18582.169
HA = 18589.864
SA = 170.81253

```

Appendix C. Continued.

```

      FUNCTION TSATF(OEN)
C      ITERATE T TO MINIMIZE (DEN-DCALC) VIA DENGASF(T), DENLIQF(T).
      COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,OPMOT,OPDD,OPOR,DTSOR,OTHDR
      COMMON/5/ DSDT
      OATA (Q=2.0),(FN=6.3890561)
C      NOTE, FN = EXP(Q) - 1.0.
      1 FORMAT(1H0 9X *TSATF FAILS TO CONVERGE. * / )
      2 S = DEN/DCRT $ YN = TCRT/TTRP - 1 $ IF(DEN-OCRT) 3,30,4
      3 ST=OGAT/DCRT $ F=ALOG(S)/ALOG(ST)*((1-S)/(1-ST))**2 $ GO TO 5
      4 ST=OTRP/DCRT $ U=((S-1)/(ST-1))**3 $ F=(EXP(Q*U)-1)/FN
      5 T = TCRT/(1 + YN*F)
      6 DO 15 J=1,50 $ IF(DEN-DCRT) 7,30,8
      7 OO = DEN - DENGASF(T) $ GO TO 9
      8 OO = DEN - DENLIQF(T)
      9 IF(ABS(OO/DEN).LT.1.0E-7) 16,10
      10 OT = OO/DSDT $ IF(ABS(OT/T).LT.1.0E-7) 16,11
      11 T = T + OT $ IF(T) 12,12,13
      12 T = TTRP $ GO TO 15
      13 IF(T.LT.TCRT) 15,14
      14 T = TCRT - 0.10
      15 CONTINUE $ PRINT 1 $ STOP
      16 TSATF = T $ DTSOR = DTRP/DSDT $ RETURN
      30 TSATF = TCRT $ DTSOR = 0 $ RETURN $ ENO

```

```

      FUNCTION XBF(T,D)
C      XBF = SQRT(T/TC)*LN(T/TS) = Q(T)*Z(R,T),
      COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,OPMOT,OPDD,OPOR,DTSOR,OTHDR
      COMMON/4/ XB1,XB2, XE1,XE2, OXBOR, OXEOR
      COMMON/6/ TSAT, THETA, PSAT
      1 TC = TCRT $ TS = TSAT $ X = T/TC
      2 U = T/TS $ U1X = TC/TS $ U1R = -U*DTSOR/TS
      3 Z = ALOG(U) $ Z1R=U1R/U $ Z1X=U1X/U $ Z2X=-Z1X*Z1X
      4 Q = SQRT(X) $ Q1 = 0.5/Q $ Q2 = -Q1/2/X
      5 XBF = Q*Z $ OXBOR = Q*Z1R $ XB1 = Q*Z1X + Q1*Z
      6 XB2 = Q*Z2X + Q1*2*Z1X + Q2*Z $ RETURN $ ENO

```

```

      FUNCTION XEF(T,D)
C      XEF(T,D) = PSI(T,O) - PSISAT(O), WHERE -
C      PSI = DE/X + (1-DE)*(1 - W + W*LN(W)), W = (1-TH/T).
      COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,OPMOT,OPDD,OPOR,DTSOR,OTHDR
      COMMON/4/ XB1,XB2, XE1,XE2, OXBOR, OXEOR
      COMMON/6/ TSAT, THETA, PSAT
      2 A = DE $ B = 1-A $ TC = TCRT $ TH = THETA $ TS = TSAT
      3 X = T/TC $ X2 = X*X $ XS = TS/TC $ XS1 = OTSOR/TC
      4 W = 1.0 - TH/T $ IF(W) 30,30,5
      5 W1R = -OTHOR/T $ W1X = TH/T/X $ W2X = -2*W1X/X
      6 G=ALOG(W) $ G1R=W1R/W $ G1X=W1X/W $ G2X = W2X/W - G1X*G1X
      10 P = A/X + B*(W*G - W + 1) $ P1R = B*(W*G1R + W1R*G - W1R)
      11 XE1 = -A/X2 + B*(W*G1X + W1X*G - W1X)
      12 XE2 = 2*A/X/X2 + B*(W*G2X + 2*W1X*G1X + W2X*G - W2X)
      19 WS = 1.0 - TH/TS $ IF(WS) 20,20,21
      20 PS = 1 $ PS1 = 0 $ GO TO 25
      21 GS = ALOG(WS) $ PS = A/XS + B*(WS*GS - WS + 1)
      22 PS1 = -A*XS1/XS/XS + B*(TH*OTSOR/TS - OTHDR)*GS/TS
      25 XEF = P - PS $ OXEOR = P1R - PS1 $ RETURN
      30 XEF = XE1 = XE2 = OXEOR = 0 $ RETURN $ ENO

```

Appendix C. Continued.

```

SUBROUTINE YESAVAG
C READ AND COMPARE YESAVAGE SP.HEATS CP(T) ALONG ISOBARS.
COMMON/1/AL,BE,GA,DE, DCRT,TCRT,PCRT, DGAT, DTRP,TTRP,PTRP
COMMON/7/TA,TB,PB, EA,HA,SA, HB,SB, TY1,TY2, DYH,DYS
COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
DIMENSION PSI(5),TF(12),CPB(5,12)
DATA (TCRT=369.8),(TB=405.0)
DATA (Q=1.01325),(QP=14.69595),(CPK=184.5027)
1 FORMAT(10X 5F10.0)
2 FORMAT(6F10.0)
3 FORMAT(1H0// 17X *YESAVAGE CP(T) ISOBAR AT P,BAR =* F8.3//
1 17X 3HT,K 5X5HMOL/L 3X7HJ/MOL/K 5X5HCALCD 4X4HPCNT )
4 FORMAT(10X 2F10.3, 2F10.2, F8.2)
5 FORMAT(1H0 14X 4HNP = I4, 11H, MEANPCT = F6.2)
10 READ 1, (PSI(I),I=1,5) $ DO 11 J=1,12
11 READ 2, TF(J), (CPB(I,J),I=1,5) $ SS = NP = 0
C COMPARE WITH MY RESULTS ALONG HIS ISOBARS.
20 DO 90 I=1,5 $ P = Q*PSI(I)/QP $ PRINT 3, P
21 IF(P.LT.PCRT) 22,50
22 TS = FINDTSF(P) $ DO 40 J=1,12
23 T = (TF(J)-32)/1.8 + 273.15 $ CPY=CPK*CPB(I,J) $ IF(CPY) 24,40
24 IF(T.LT.TS) 25,31
25 IF(T.LT.TA) 26,27
26 CALL COMLIQ $ GO TO 32
27 CALL COMPRLQ $ GO TO 32
31 CALL GENEIOUS
32 DIF=CPY-CP $ PCT=100*DIF/CPY $ NP=NP+1 $ SS=SS+ABS(PCT)
33 PRINT 4, T,DEN,CPY, CP,PCT
40 CONTINUE $ GO TO 90
C CASES FOR P GREATER THAN PCRT.
50 DO 70 J=1,12 $ T = (TF(J)-32)/1.8 + 273.15
52 CPY = CPK*CPB(I,J) $ IF(CPY) 53,70
53 IF(T.LT.361) 55,54
54 IF(T.LT.TB) 56,58
C CASE FOR T LESS THAN TCRT.
55 CALL COMPRLQ $ GO TO 60
C CASES FOR T.GT.TC.AND.T.LT.TB.
56 DX = FINDENF(T,P) $ IF(DX.GT.DCRT) 57,58
57 CALL LIQTHRM $ GO TO 60
58 CALL GENEIOUS
60 DIF=CPY-CP $ PCT=100*DIF/CPY $ NP=NP+1 $ SS=SS+ABS(PCT)
61 PRINT 4, T,DEN,CPY, CP,PCT
70 CONTINUE
90 CONTINUE $ SS = SS/NP $ PRINT 6, NP, SS
99 RETURN $ END

```

PROPANE FUNCTIONS AT POINT (TB,PB)

T = 405.000, P = 103.42135, DEN = 7.3637

EZ = 20390.536, E = 39050.050

HZ = 23757.844, H = 40454.530

SZ = 295.86896, S = 236.93524

CVZ = 86.584, CV = 96.926

CPZ = 94.899, CP = 170.706

YESAVAGE VALUE, CP = 168.368



Appendix C. Continued.

```

      PROGRAM ZIEGLER (OUTPUT)
C     PROPANE, ESTIM. V.P. AND QVAP FROM TRIPLE- TO BOILING-POINTS,
C     USING ENTHALPY AND ENTROPY CLOSED LOOPS.
      COMMON/1/ TA,TB,PB,QB, DELH,DELS
      COMMON/2/ EZA,HZA,SZA, HGB,SGB, DHLAB,DSLAB
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,OTHOR
      COMMON/9/ PZIP, BZ, DBZDT, DPZDT, OZDD
      COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DIMENSION QK(2),TK(150),OK(150),PIK(150),PK(150),QJ(150)
3     FORMAT(1H1 11X *PRDPANE ESTIM. V.P.,BAR, AND QVAP, KJ/MOL. * //
1     12X 4HTB =F10.5, 6H, PB =F8.5, 6H, DB =F9.6/
2     12X5HEZB =F7.1, 7H, EGB =F7.1, 7H, HZB =F8.1, 7H, HGB =F8.1/
3     12X 5HSZB =F9.4, 7H, SGB =F9.4, 6H, QB =F8.1/ )
4     FORMAT(7X 3HT,K 8X2HPI 6X5HP,BAR 5X5HMOL/L 6X3HHZA 6X3HHGA
1     1 6X3HSZA 6X3HSGA 4X5HOGAB 4X5HDLAB 4X5HOSGAB 4X5HOSLAB
2     2 5X3HQA 5X3HQAS )
5     FORMAT(2XF8.2, E10.4,E11.5,E10.4, 2F9.1,2F9.3, 2F9.1,2F9.3, 2F8.3)
6     FORMAT(12X 3HT,K 4X5H100/T 7X5HP,EQN 7X5HP,BAR 6X5HLN(P)
1     1 7X5HMDL/L 3X5HQ,EQN 3X5HQ,VAP )
7     FORMAT(5X F10.2, F9.5, 2E12.5, F11.5, E12.5, 2F8.3)
8     TTRP = 85.47 $ TB = 231.0707 $ PB = 1.01325
9     QK(1) = 18780.0 $ QK(2) = 18864.0
C     GET HGB, SGB FOR SATVAPOR AT THE BOILING POINT.
10    TI = TB $ CALL IOEAL $ EZB=EZ $ HZB=HZ $ SZB=SZ
11    ONB = FINDENF(TB,PB) $ EGB = EZ + EDELFTB,ONB)
12    SGB = SZ + OELS $ HGB = EGB + 100*PB/ONB
C     USE BOTH KEMP,EGAN QK(1), AND R.O.G. QK(2).
14    DO 99 I=1,2 $ QB = QK(I)
15    PRINT 3, TB,PB,ONB, EZB,EGB, HZB,HGB, SZB,SGB, QB $ PRINT 4
C     DO TEMPERATURES FROM TRIPLE- TO BOILING-POINTS -
20    DO 50 J=1,147 $ IF(J.EQ.1) 21,22
21    TA = T = TTRP $ GO TO 23
22    TA = T = 84 + J
C     GET EZA, HZA, SZA AT T = TA.
23    TI = TA $ CALL IDEAL $ EZA=EZ $ HZA=HZ $ SZA=SZ
C     GET DHLAB, DSLAB FOR THE SATDLIQUID FROM TA TO TB.
24    CALL CSATSUM $ DHLAB = OELH $ DSLAB = OELS
C     NOW ITERATE P (T=TA) TO MINIMIZE (QA - QAS).
30    P = PI = PSATF(T) $ DP = P/2 $ SS = DELTAF(T,P)
31    DO 40 IT=1,15 $ PL = P-DP $ SL = DELTAF(T,PL)
32    PP = P+OP $ SP = OELTAF(T,PP)
35    IF(SL-SS) 36,36,38
36    IF(SL-SP) 37,37,39
37    SS = SL $ P = P - OP $ GO TO 40
38    IF(SP-SS) 39,40,40
39    SS = SP $ P = P + OP
40    OP = OP/2 $ DNA = FINDENF(T,P)
C     USE FINAL P TO GET ONA, HGA, SGA, OHGAB,OSGAB,
C     AND THEN, VIA LOOP, GET QAH, QAS.
42    EGA = EZA + EDELFT(T,ONA) $ SGA = SZA + DELS
43    HGA = EGA + 100*P/ONA $ OHGAB=HGB-HGA $ OSGAB=SGB-SGA
44    QAH = QB + DHLAB - OHGAB $ QAS = TA*(QB/TB + DSLAB - OSGAB)
45    QAH = QAH/1000 $ QAS = QAS/1000 $ PIK(J) = PI
46    TK(J)=TA $ OK(J)=DNA $ PK(J)=P $ QJ(J) = (QAH+QAS)/2
50    PRINT 5, TA,PI,P,ONA, HZA,HGA, SZA,SGA, OHGAB,DHLAB,
1     1 OSGAB, DSLAB, QAH,QAS
C     PRINT T,1/T, PEQN,P,LN(P), ONA, QEQN,Q, FOR PUBLICATION.
61    PRINT 3, TB,PB,ONB, EZB,EGB, HZB,HGB, SZB,SGB, QB $ PRINT 6
65    DO 99 J=1,147 $ IF(J.EQ.50.OR.J.EQ.99) 67,70
67    PRINT 3, TB,PB,ONB, EZB,EGB, HZB,HGB, SZB,SGB, QB $ PRINT 6
70    T = TK(J) $ AT = 100/T $ P = PK(J) $ GP = ALOG(P)
71    QE = QVAPXF(T)/1000
75    PRINT 7, T,AT, PIK(J),P,GP, OK(J), QE,QJ(J)
99    CONTINUE $ STOP $ END

```

Appendix C. Continued.

```

SUBROUTINE CSATSUM
C   GET DELH, DELS ALONG SATDLIQ FROM TA TO TB.
COMMON/1/ TA,TB,PB,QB, OELH,DELS
COMMON/3/DPOT,O2PDT2,OPSOT,DPMDT,DPOO,OPOR,DTSOR,OTHOR
1  E = H = S = 0
2  TR = TB - TA $ N = ABS(TR)/2 + 2 $ QT = TR/N
3  DO 8 J=1,N $ TJ = TA + (J-0.5)*DT
4  CS = CSATXF(TJ) $ PS = PSATF(TJ) $ DS = OENLIQF(TJ)
5  H = H + CS*DT + 1Q0*DPST*DT/OS $ S = S + CS*DT/TJ
8  CONTINUE
9  DELH = H $ OELS = S $ RETURN $ END

FUNCTION DELTAF(T,P)
C   GET DNA,EGA,HGA,SGA FOR SATOVAPOR AT T,P, (T=TA),
C   GET DHGAB = HGB-HGA, OSGAB = SGB-SGA,
C   GET QAH, QAS VIA CLOSEO LOOPS, THEN, DELTAF = ABS(QAH-QAS).
COMMON/1/ TA,TB,PB,QB, DELH,DELS
COMMON/2/ EZA,HZA,SZA, HGB,SGB, DHLAB,DSLAB
COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CP7
1  IF(P.GT.0) 2,9
2  DNA = FINOENF(T,P) $ EGA = EZA + EOELF(T,DNA)
3  SGA = SZA + DELS $ HGA = EGA + 100*P/DNA
5  DHGAB = HGB - HGA $ OSGAB = SGB - SGA
6  QAH = QB + DHLAB - DHGAB $ QAS = T*(QB/TB + DSLAB - OSGAB)
8  DELTAF = ABS(QAH-QAS) $ RETURN
9  DELTAF = 1.0E+100 $ RETURN $ END

FUNCTION EOELF(T,D)
C   CHANGE OF E,S ON ISOTHERM T FROM OEN = 0 TO DEN = D.
C   USE VIRIAL EQNSTATE. NOTE OCZ = 5.0 MOL/L.
C   DELE = EOELF = -R*(D/DCZ)*T*OB(T)/OT,
C   DELS = -R*LN(O*R*T/P1) - R*(O/DCZ)*(B(T) + T*OB(T)/DT).
COMMON/1/ TA,TB,PB,QB, OELH,DELS
COMMON/9/ PZIP, BZ, OBZOT, DPZOT, OZOO
DATA (Q=1.01325),(R=0.0831434),(OCZ=4.96)
1  Z = ZIPF(T,O) $ EOELF = -100*R*(O/DCZ)*T*OBZOT
2  OELS = ALOG(O*R*T/Q) + (O/OCZ)*(BZ + T*OBZOT)
9  OELS = -100*R*DELS $ RETURN $ END

FUNCTION FINOENF(T,P)
C   GIVEN P,T IN VIRIAL EQN., SOLVE QUADRATIC FOR DEN, MOL/L.
DATA (DCRT=4.96),(TCRT=369.80),(R=0.0831434)
DATA (B1=0.4540611),(B2=-1.1899134),(B3=-0.4726952)
1  X = T/TCRT $ B = B1 + B2/X + B3/X/X/X
2  Q = SQRT(1.0 + 4*P*B/R/T/DCRT)
3  FINOENF = DCRT*(Q-1)/2/B $ RETURN $ END

FUNCTION ZIPF(T,D)
C   PROPANE VIRIAL EQUATION, R.O.G., MAY 6, 1976.
C   Z(T,O) = 1 + B(X)*S, X = T/TCRT, S = DEN/OCRT,
C   B(X) = B1 + B2/X + B3/X3. DEN IN MOL/L.
COMMON/9/ PZIP, BZ, OBZOT, DPZOT, OZOO
DATA (OCRT=4.96),(TCRT=369.80),(R=0.0831434)
DATA (B1=0.4540611),(B2=-1.1899134),(B3=-0.4726952)
1  S = O/OCRT $ X = T/TCRT $ X2 = X*X $ X3 = X*X2
2  BZ = B = B1 + B2/X + B3/X3
3  ZIPF = 1.0 + B*S $ PZIP = O*R*T*ZIPF
4  OBZOT = -(B2/X2 + 3*B3/X/X3)/TCRT $ OZOD = B/OCRT
5  DPZOT = O*R*(S*T*OBZOT + ZIPF) $ RETURN $ END

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